

SCIENCE.

FRIDAY, FEBRUARY 26, 1886.

COMMENT AND CRITICISM.

PROFESSOR FREDERICQ of the University of Ghent, who has previously published essays on the modes of teaching history in Germany and in France, has recently issued a pamphlet on the study of history at the English and Scotch universities. At the latter he finds that little or no university instruction in history is given, but passes much favorable criticism on the methods in the historical schools of Oxford and Cambridge. Professor Fredericq makes one remark that we may well take home to ourselves; and that is, that the English universities provide no adequate education in what the Germans call 'Quellenstudie.' Anyone who has seen an historical seminar at a German university knows what an important part of historical instruction is made up by the study of chronology, paleography, and documents: in fact, the study of authorities forms the basis of all historical teaching in Germany. Edward A. Freeman, in his inaugural lecture, on 'The office of the historical professor,' delivered at Oxford in the autumn of 1884, touched upon this point, and announced his intention of giving much attention to the study of authorities. It is well known that Professor Seeley of Cambridge, and Prof. S. R. Gardiner also, have not failed of their duty in this particular; but with them we fear that the list ends. And in America we have until lately almost entirely overlooked this essential in historical knowledge. But the Johns Hopkins university, and, in a less degree, Columbia college, are pursuing the right method; and at both the historical student is taught to estimate and handle original materials, not merely stuffed with facts and dates at second-hand. It is only in this way that the student can ever obtain any thing more than a superficial knowledge of his subject, and come thoroughly in contact with the times he is investigating. It is not too much to say that the study of history without historical method is empty, and historical method is the greatest part of the study of history. If Professor Fredericq ever includes America in his investigations, we fear that the list of historical

teachers who appreciate the value of 'Quellenstudie' will be even smaller than in England.

MR. BRADFORD LESLIE, in a paper read before the British institution of civil engineers, 'On an improved method of lighting vessels under way at night,' attempts to solve the difficult problem of enabling ships which are rapidly approaching at night, to determine their respective courses in time to manoeuvre with safety. To secure this result, many arrangements of lights have been proposed, but none, we believe, exactly like that suggested by Mr. Leslie. His plan, in general, is for a steamer to carry three white lights forward (two for a sailing-vessel), — one at the masthead, one on the forestay, and one on the stem; the three in line, and making an angle of 45° with the horizon. These would be plainly visible for eight or nine miles through a forward arc of 220° , or from two points abaft the beam on each side. It is evident that the course of the ship, under favorable circumstances, could be known always by observing the divergence between the line of the lights and the vertical. This angle decreases from 45° , for a course at right angles to the observer, to 0° when the ship is approaching head on. The latter, and those which approximate to it, are obviously the most critical courses, for which this system is especially valuable. The apparent angle of the line of lights with the vertical coincides nearly enough, for all practical purposes, up to 20° , or about two points, with the angle between the course of the approaching ship and the line of vision. This fact is of great value when there is no time to determine angles, either by plotting or calculation. It is not proposed to abandon the use of the colored side-lights, although, if the arrangement were entirely satisfactory in practice, they would be no longer necessary. The most serious obstacle to the success of this plan is the rolling and heeling motion of the ship, to which Mr. Leslie refers, but which, we believe, he underestimates. The principle involved in his suggestion is not new. It has been already proposed to arrange the masthead and side-lights to form an equilateral triangle in a plane parallel to the midshipsection, and also to place the masthead light so far aft that the line through it and either

of the side-lights should make an angle of 45° with the horizon. The system which has received the most attention, however, is known as that of the double side-lights. Various arrangements of these have been proposed, but all include the use of two lights on each side, in different positions with respect to each other, and at different distances apart. The subject of lighting ships, and also that of 'the rules of the road,' should be referred to an international commission, whose recommendations should be accepted and rigidly enforced by all maritime nations.

THE STUDY OF THE POLITICAL SCIENCES has made great progress of late in this country. Columbia, Cornell, and the University of Michigan, have established special schools of political science, all of which are successful; special attention is paid to these subjects at Harvard and Johns Hopkins; and the historical, economic, and social science associations, which have sprung up during the last decade, with their published proceedings, have all contributed to stimulate an interest in the scientific treatment of history, law, and economics. The latest advance in this field is the establishment of the *Political science quarterly*, edited by the faculty of political science of Columbia college, and published by Ginn & Co. The first number of this new quarterly will appear in March, and it will furnish a field for the discussion of all questions—historic, economic, or legal—which concern the organization of the state, the evolution of law, the relation of states one to another, and the relation of government to the individual. The quarterly will demand no political or economic orthodoxy, but will admit all articles within its scope which are at once scientific and of general interest. A feature of the publication will be its bibliography, which will be very complete and elaborate. The great success of the Johns Hopkins series of studies in historical and political science has doubtless led the Columbia professors to the establishment of this journal; and there is every prospect that it, too, will meet with favor. The whole development of which the above are the indications is a healthy and vigorous one. It betokens the introduction and application of scientific tests and methods in a domain which has in the past been too fruitful of partisan strife and dissensions.

IN 1880 A SITE was purchased for a new naval observatory a short distance beyond Georgetown,

in the District of Columbia; but no appropriation has yet been made for erecting the necessary buildings, and removing the instruments from the present location. On account of this delay the secretary of the navy, in April, 1885, called upon the National academy of sciences for an expression of opinion as to the advisability of proceeding promptly with the erection of a new naval observatory; and the reply of the committee of the academy is contained at length in a letter from the secretary of the navy, just published as Executive document No. 67. The conclusions of the committee we give in the language of the report. This report is signed by F. A. P. Barnard, A. Graham Bell, J. D. Dana, S. P. Langley, Theodore Lyman, E. C. Pickering, C. A. Young. 1. It is advisable to proceed promptly with the erection of a new observatory upon the site purchased in 1880 for this purpose. 2. It is advisable that the observatory so erected shall be, and shall be styled, as the present observatory was styled originally, the 'National observatory of the United States,' and that it shall be under civilian administration. 3. It is advisable that the instruments in the present observatory, with the exception of the 26-inch telescope, the transit circles, and the prime vertical transit, shall be transferred to the observatory at Annapolis, with such members of the astronomical staff as may be required to operate them; also that such books of the library as relate chiefly to navigation shall take the same destination; the instruments above particularly specified, with the remainder of the library, being reserved as part of the equipment of the new national observatory, to which also the remaining officers of the astronomical staff shall be assigned for duty. 4. It is advisable that the observatory at Annapolis shall be enlarged, if necessary, and adapted to subserve as effectually as possible the wants of the naval service, whether practical, scientific, or educational; that it shall be under the direction of the department of the navy, and shall be styled the 'Naval observatory of the United States.' The grounds upon which this decision is based are set forth in the document to which we have referred; and numerous letters are appended, from astronomers and others, in regard to the administration of the observatory, and from physicians of Washington, upon the healthfulness of the portion of the city in which the observatory is at present situated. It will be seen immediately that this report is intended to favor the establishment of an observatory worthy

of the country, and the placing its control in the hands of those who have made astronomy their life-work. The navy will be provided, if the recommendations are carried out, with an observatory well suited to its special needs, and would be relieved from the task of supervising work in which it has no interest aside from that felt in scientific work in general.

CRATER LAKE, OREGON, A PROPOSED NATIONAL RESERVATION.

IN the heart of the Cascade Range there is a little sheet of water which is destined to take high rank among the wonders of the world. It is a unique phenomenon, taken as a whole, though some of its component features, taken singly, may not be unexampled. The lake is about seven and one-half miles long and five miles wide. Its shape is very nearly elliptical, without bays or promontories. It is girt about by a complete circuit of cliffs, nowhere affording an outlet. These cliffs rise to altitudes varying from 900 to 2,300 feet above the water, and, though generally too steep to be either ascended or descended, have in some places an inclination low enough to render such a feat possible, though difficult. They plunge at once into deep water, and never afford a wide margin for standing or walking room at the water's edge. In a few places, however, the rains have scoured gulleys in the wall; and, where these debouch upon the lake surface, may be found narrow spaces for lodgement. No considerable stream or brook has been discovered flowing into the lake as yet; but a few springs yield little rills of water in the faces of the walls. Others and larger ones may come to light when the lake is more minutely explored. Neither is there any visible outlet. It is certain, however, that there must be a mode of escape for the water; and, as it is not above ground, it must needs be below ground, for the evaporation here is less than the precipitation.

Near the south-western margin, about half a mile from the shore, there rises out of the water a cinder-cone. Its height is between 600 and 700 feet. It is quite perfect and typical in form, having the usual cup or hopper in its summit, and as yet it is not perceptibly eroded. It is well covered with timber, and, notwithstanding its perfect preservation, it cannot be regarded as being, in the historic sense, a recent creation. From its base two streams of lava stretch out towards the great wall, but do not reach it. The insulation of the cone and its lavas is still complete.

The beauty and majesty of the scene are indescribable. As the visitor reaches the brink of the

cliff, he suddenly sees below him an expanse of ultramarine blue of a richness and intensity which he has probably never seen before, and will not be likely to see again. Lake Tahoe may rival this color, but cannot surpass it. It is deeper and richer than the blue of the sky above on the clearest day. Just at the margin of the lake it shades into a turquoise, which is, if possible, more beautiful still. Ordinarily the water surface is mirror-like, and reflects an inverted image of the surrounding cliffs in detail. Very majestic, too, are the great environing walls. On the west side they reach their greatest altitude, rising almost vertically more than 2,000 feet above the water. It is difficult to compare this scene with any other in the world, for there is none that sufficiently resembles it; but, in a general way, it may be said that it is of the same order of impressiveness and beauty as the Yosemite valley. It was touching to see the worthy but untutored people, who had ridden a hundred miles in freight-wagons to behold it, vainly striving to keep back tears as they poured forth their exclamations of wonder and joy akin to pain. Nor was it less so to see so cultivated and learned a man as my companion hardly able to command himself to speak with his customary calmness.

To the geologist this remarkable feature is not less impressive than it is to the lover of the beautiful; for, almost at the first glance, it reveals something which would probably escape the eye of the mere tourist. This broad depression was once filled and occupied by a large volcanic cone, rising far above the loftiest point of its encircling walls.

The proof is simple and conclusive. Whoever has studied a large volcanic cone, composed of lavas piled sheet upon sheet around a central orifice, and which has been subject to long-continued erosion, will be able to recall some general facts as to the ravines and water-courses which have been scoured in its flanks. As we approach such a mountain, we observe the ravines opening upon the plain, or gentle slope, around its base, with huge buttresses between them, sometimes rounded and broad, sometimes narrow and knife-edged, according as the spaces between ravines are great or small. As we ascend the bed of any one of them, we observe that it grows deeper and deeper, while the intervening buttresses rise higher and higher, until a maximum depth is reached. Farther up, the declivity of the bed becomes greater, lateral streams come in, the ravine branches repeatedly, and up near the summit it resolves itself into a plexus of small rills, all embraced in an amphitheatre,

above which the culminating peak rises sharply. Each portion of the length of the ravine has its characteristic features or habitus; and, however irregular these minuter details may be, they seldom mask or obscure the characteristics of the larger ones.

Imagine, then, a great volcanic cone, on which erosion has made considerable though not extreme progress, to be truncated at about one-third to one-half the height above the base, the upper half or two-thirds of the altitude removed, and a vast depression excavated in the remaining portion. The steep wall-faces of this excavation would cut the buttresses and ravines a little below the maximum depths of the latter. The crest-line at the edge of the pit, as we followed around its periphery, would rise sharply to go over the buttresses, and descend as sharply to cross the beds of the old ravines, making it a jagged edge. It is so at Crater Lake. As we ascend the ravines, we find them growing deeper and steeper, until at last their upper courses are suddenly cut off at the brink of the great pit. On either hand rises the old buttresses many hundreds, sometimes more than a thousand, feet above us. The imagination only can picture the restoration of the missing pile and the upward continuation of the great ridges and furrows now ending so strangely, and otherwise unaccountably, upon the brink of this deep gulf. Whether the mountain culminated in a sharp and lofty cone like Mt. Pitt and Mt. Scott to the south of it, and Mt. Thielson to the north, or was a somewhat flatter structure like Union Peak to the east of it, is more doubtful. The general configuration of the ravines, and the absence of large masses of tuff, or fragmental ejecta, in the original pile, indicate the flatter, or dome-like form; and this is decidedly the prevailing form of mountains in the Cascade Range, though many sharp peaks are scattered among them. What dire catastrophe has destroyed this cone?

Great pit-craters, or, as I have termed them elsewhere, 'calderas,' are not very common. Still they exist in several parts of the world; and of some of them we know the history, or may infer it with considerable confidence.

There are three or four large ones in the Hawaiian Islands. One is on the summit of Mauna Loa; a second is the famous Kilauea; and the largest and most wonderful of all is the immense caldera of Haleakala, on the island of Maui. But none of them are so large as Crater Lake, nor so deep. The origin of these I have endeavored to explain in a paper on the Hawaiian volcanoes, published in the 'Fourth annual report of the U.S. geological survey.' In the correctness of this

explanation I feel great confidence. The evidence of it is summed up in the paper referred to. These 'craters,' or calderas as they are there called, appear to have been formed gradually, through the melting of the cores of the mountains by superheated lavas (i.e., lavas of higher temperature than is necessary for the fusion of their materials), rising from great depths in the earth through volcanic pipes. The peculiarities of the Hawaiian lavas are the absence or rarity of explosive or violent action, their high temperature and great liquidity. They rise in the volcanic pipes, and remain stationary at a certain altitude; and in Kilauea they maintain large lakes of lava open to the sky in a state of continuous fusion. But beneath the floor of the caldera they form lakes of still greater extent. Eruptions occur from time to time; but the lavas, instead of overflowing from the summit of the volcanic pile, burst out miles away from it, and far down the gently sloping sides of the cone at levels thousands of feet lower than the crater. The lavas beneath the caldera are drained; and the upper portion of the mountain, robbed of the liquid support which has held it up, sinks in. The surface-rocks, being vesicular or spongy, are light enough to float on the liquid lava so long as the latter maintains its level in the stand-pipe; but, when the liquid is tapped off through a lateral vent in the mountain-side, the upper crust settles, as would the ice in a pond when the water is drained from beneath it. The evidence of this action at Kilauea, on Mauna Loa, and still more emphatically on Haleakala, is very clear and unmistakable.

But there is another class of calderas, formed by a mode of volcanic action which is in the strongest possible contrast with the foregoing; and we are not left in any doubt as to its general nature, for it has been witnessed and reported upon by competent authority. In the islands of the East Indian archipelago, stretching from the Straits of Sunda eastward to the island of Timor, is found a chain of volcanoes comprising hundreds of individual cones. During the period of occupation of these islands by the Dutch, numerous eruptions have occurred; and the most characteristic feature of them has been their terrible and devastating energy. Some of the volcanoes are truncated cones, with large calderas in their summits. Two of them have been formed within the historic period, and accounts of their formation have been preserved. One of these, in the summit of the volcano Papandayang, on the island of Java, was formed in 1772, by an explosion rivalling in destructiveness and energy the outbreak of Krakatoa in 1883. The other is found in the summit of the volcano Tomboro, on

the island of Sumbawa, and the date of its formation was 1815. The incidents of this last eruption were investigated by Dr. Junghuhn, whose work on the volcanoes of the East Indies is now a classic one in the annals of volcanism. Judging from his account, this must have been the most energetic and destructive explosion of which any authentic account has been preserved, surpassing greatly that of Krakatoa. Prior to the outbreak, Tomboro was a shapely cone, rising a few miles from the shore to an altitude of more than 9,000 feet. In a single night the upper 5,000 feet was blown into fragments, which were scattered over thousands of square miles of sea and land; while the volcanic dust darkened the air over a million square miles of island and ocean. Many months afterward, when the scene could be visited, Tomboro was a mere stump of a mountain, with a large crater in the place of the cone which had been blown away. Other instances of a similar nature might be mentioned, but the foregoing may suffice.

We have, then, examples of depressions similar to that of Crater Lake produced by two very different modes of action. To which of them may we refer the origin of the magnificent crater of the Cascades? Just at present a confident answer cannot be given; for the ground has not been sufficiently studied. The facts brought to light by the first hasty reconnaissance seemed to indicate the explosive action, rather than the quiet method of subterranean fusion. But it is best to await the results of a more critical examination before committing ourselves to any opinion. It may be well, however, to state such facts as have already come to light, as well as some general considerations pertinent to the subject, and let them pass for what they are worth.

1°. In the Hawaiian calderas the evidences of sinkage are conspicuous. They are not confined to the deeper floors of the pits, but are also seen in the partial subsidence of great blocks or slices of the walls immediately enclosing them, and in irregular sunken spots in their vicinity, also in the marks of powerful shearing or faulting action in the walls themselves. They appear to be correlated to the remarkably quiet habits of the Hawaiian volcanoes, to their habitual modes of eruption, and to the special structure of the volcanic piles, which do not rise in steep conical peaks, but are very broad and flat. At Crater Lake, neither in the walls themselves, nor in the immediate neighborhood back of the crest-line, have any traces of sinkage been observed as yet. Nothing can at present be pointed out which suggests the Hawaiian mode of origin, beyond the fact that a vast crater is before us. The general

structure and habits of the Cascade volcanoes are indicative of a more vigorous style of volcanic action than the Hawaiian.

2°. Crater Lake is the centre, and, without much doubt, the source, of an extraordinary quantity of andesitic pumice and tuff, which is scattered far and wide over a circle of country ranging from 40 to 60 miles in diameter. It often lies in beds several hundred feet deep, and covering hundreds of square miles. This pumice is not such as is often seen in some lava streams, but consists of rounded masses and pellets which seldom exceed a cubic foot in volume, and grade down to fine, light sand. It is the kind which is blown violently from a volcano during eruption, and projected high in air, to fall in showers over the surrounding country. It is found on the loftiest peaks and mountains anywhere within 20 miles of the lake, and assuredly did not emanate from the peaks on which it now lies. Vast quantities of it have been gathered up by the rains and streams (for it is lighter than cork), and swept eastward into the broad basins of Klamath Marsh and Klamath Lake, or carried westward through the Rogue River into the Pacific. The finer lapilli and sand have been consolidated into beds, which flank the eastern slope of the Cascades, and are also found west of its divide in the flatter spaces beyond the base of the truncated pile which holds the crater. These are well exposed in the walls of little box-cañons two or three hundred feet deep, and the tuff weathers out into pleasing columnar forms. The tuff is older than the pumice, for, wherever the two were seen together, the tuff was undermost. This light fragmental material, its wide distribution in every direction, with the lake as the centre of dispersion, the very light and highly vesicular character of the pumice,—all indicate that at some time Crater Lake has been the scene of some sort of very energetic volcanic action.

3°. But there is a weak point in the argument. If a large cone, composed of solid lavas such as are now seen in the walls of the lake basin, has been blown into rubble, and the fragments hurled far and wide over the surrounding country, ought we not to be able to recognize them in vast abundance in the vicinity? Most certainly we ought to. And yet in close proximity to the lake no fragments were noted, except such as we always expect to find at the foot of steep spurs and ridges of volcanic rock, and which have broken down from them in the ordinary course of weathering. This absence of the *corpus delicti* is a serious difficulty in the way of a speedy conclusion that the mountain was blown up by any such summary proceeding as Tomboro or Krakatoa, and indicates

the importance of further search after evidences of infugment.

Regarding the age of the caldera, it would be premature to offer any opinion, beyond the vague and general statement, that it is certainly many thousands of years old. There is abundant reason to hope, however, that further examination will throw some light on this question. We cannot, indeed, expect to reach any estimate of its age in terms of years and centuries; and our hope must be confined to that of fixing its relative age in terms of the geological calendar. Viewed in that relation, it may be said with equal confidence that its age is not great. C. E. DUTTON.

THE FISH-CULTURAL STATION AT GLOUCESTER, MASS.

WE are informed that it is the intention of Professor Baird, the U. S. commissioner of fisheries, now that methods and apparatus for hatching successfully the buoyant eggs of the cod, halibut, and other marine species have been devised, to prosecute the work on as extensive a scale as the means at the command of the commissioner will permit.

Gloucester, being the centre of the cod and halibut fisheries, furnishes unusual facilities for procuring an abundant supply of eggs within easy and convenient reach of the station, and has therefore been selected as the most advantageous location, for the extensive fish-cultural work with the marine species, now projected by the U. S. commissioner. The commission steamer, the *Fish Hawk*, thoroughly equipped for hatching-work, has been ordered to Gloucester, and will take her position in the outer harbor, at some convenient point where the anchorage is safe, the water pure and free from sediment, and of sufficient density to insure the buoyancy of the eggs during incubation.

All the usual methods for collecting eggs will be resorted to, and, in addition, it is expected to interest the fishermen themselves in the work of collecting by paying a reasonable price for impregnated eggs delivered at the station. Experimental investigations will also be made to determine the practicability of forwarding impregnated eggs from Gloucester to Wood's Holl and other stations to be hatched. The species which will chiefly engage the attention of the experts of the commission are the cod, halibut, haddock, herring, and the mackerel.

The results of the work with the halibut will be watched with special interest, both by fish-culturists and by those who are engaged in the fisheries. This fish is even more prolific than the cod-

fish. Once in extraordinary abundance in Massachusetts and Ipswich bays, it has, within the memory of man, been almost exterminated in the area referred to. Have the conditions changed so as to determine the migration of the species to more congenial waters, or has man, by his direct agency in the fisheries, effected the extermination, over a given area, of a marine species of such marvellous fecundity? This is a question to which the work of the commission promises, in a few years, to furnish a satisfactory answer.

GREELY'S THREE YEARS OF ARCTIC SERVICE.

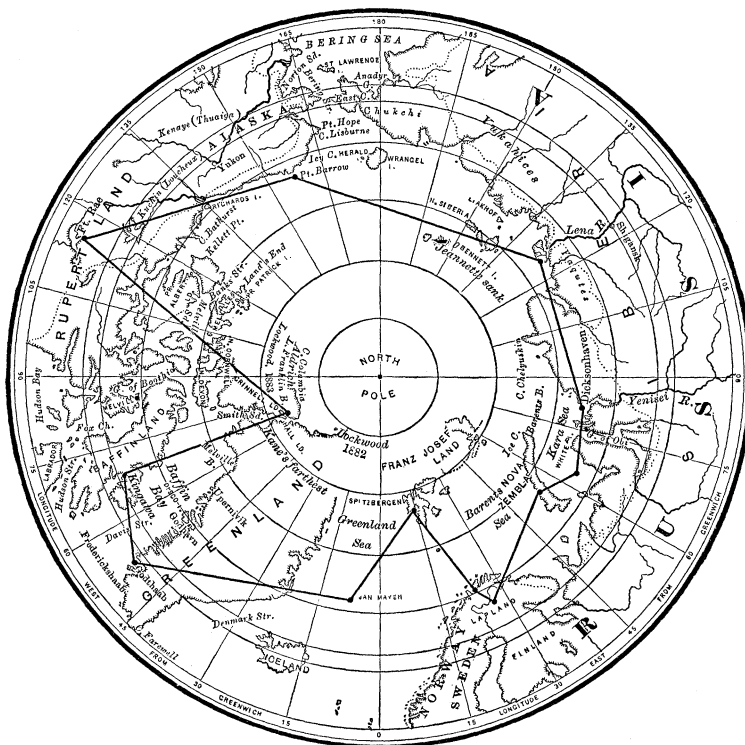
THE name and fame of Lieut. A. W. Greely of the U. S. army now belong to the history of geographical research and of undaunted heroism. The pages of this journal have so often referred to his arctic explorations that it would be superfluous to review again the thrilling incidents of his perilous voyage. The scientific world is well aware that he was sent by the U. S. government as the leader of an expedition which was to co-operate with many kindred parties in the observation of physical phenomena in the extreme north; that this arduous enterprise was not for the gratification of personal or national pride by extending the coast-lines of the northern chart, or by carrying the flag a little nearer to the pole than it had ever been borne before; that it was not for the purpose of adding renown to the army, or glory to the explorers, but to help in solving important problems in terrestrial physics by a series of exact, patient, long-continued, and carefully recorded observations in the ice-bound regions of the north.

As long ago as 1875, Lieutenant Weyprecht of the Austrian navy, who had won experience and distinction in arctic researches, succeeded in calling the attention of the civilized world to the idea that future voyages should not be planned with reference to the increase of our knowledge of geographical boundaries, but rather to the ascertainment of scientific facts, by contemporaneous observations in well-chosen stations at the north, under the concerted actions of the most experienced men and the most enlightened governments. As a result of the acceptance of this idea, fourteen stations were established by eleven co-operating nations; namely, Austria, Denmark, France, Germany, Great Britain, Holland, Norway, Russia, Sweden, and the United States. Many astronomical observatories in different parts of the globe lent their aid to the project, so that the number of

Three years of arctic service. An account of the Lady Franklin Bay expedition of 1881-84, and the attainment of the farthest north. By ADOLPHUS W. GREELY. 2 vols. New York, Scribner, 1886, 8°.

stations observing in concert was more than forty. Seven hundred men, in all, were exposed to the dangers of arctic life; but so skilful were the arrangements that no man perished, with the unfortunate exception of some who were connected with the Lady Franklin Bay expedition, and not they until after their appointed duties had been successfully completed. The results of all these efforts are gradually becoming the possession of the scientific world. It will take a long while to reduce the observations and to publish them in

Lady Franklin Bay expedition, Lieutenant Greely, although not a seaman, had some unusual qualifications. He had entered the army at the age of seventeen, and endured the privations and dangers of the civil war. After peace was established, he continued in the army as one of the officers of the signal service, and thus became expert in the kind of observations to be made at the north. His physical, intellectual, and moral qualities, as the sequel proved, were adequate to his great responsibilities, and, although disaster has cast a gloom



ARCTIC REGIONS, SHOWING LOCATION OF CIRCUMPOLAR STATIONS, 1881-83.

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proper form, and longer still to discover the laws which are suggested by the recorded phenomena; but the work projected has been done, and well done, and mankind will reap the benefits. Whether the results are more or less, Lieutenant Greely is right in saying that the work of the International polar commission will live in history, if only as an epoch in modern civilization, marked by the union of eleven great nations in planning and executing for strictly scientific purposes so expensive and dangerous a work.

For the services which were required in the

over the close of his voyage, his conduct of the work intrusted to him deserves the highest praise; and the modest record which he has now published exhibits with great accuracy and comprehensiveness the various aspects of his expedition. His pages bear the stamp of trustworthiness. There is no boasting, no self-laudation, no concealment of the embarrassments which beset the party. There is a generous recognition of the parts which were performed by all his brave associates. There is a careful record of experiences which may be useful to other navigators. There are preliminary

announcements of the scientific work of the expedition. There is no attempt at fine writing, even in those chapters which refer to most thrilling incidents; but throughout the volume may be traced the hand of a calm, observing, fair-minded, and unostentatious lover of the truth.

In thinking of the results of the Lady Franklin Bay expedition, the popular applause will commonly be given to the bravery of Lockwood and Brainard, who in May, 1882, attained the highest latitude yet reached by man ($83^{\circ} 23.8'$ north¹). Lockwood, unfortunately, died before the rescue of the expedition. Brainard came home, and, after eight years' service in the ranks, remains a sergeant, when his record would have gained him a commission at once in any other service in the world.

Another important reconnaissance was accomplished by Lockwood in a prolonged tour across Grinnell Land, where a remarkable series of fertile valleys was found, in which herds of musk-oxen pasture. Over a hundred of these animals were killed, and two hundred others were seen. The glaciers of Grinnell Land are extraordinary. On the shores of Lake Hazen, Greely discovered what he believes to have been the most northerly permanent habitation of man that is known, though the inhabitants thereof have vanished.

The physical observations proposed by the Hamburg polar conference were maintained from July 1, 1881, until June 21, 1884, — forty hours before the rescue of the survivors. Observations as to atmospheric pressure, temperature, and dew-point; direction and force of the wind; quantity, kind, and movement of clouds; the aurora, and the state of the weather, — were made hourly after Fort Conger was reached. Of the magnetometer (by which the declination of the magnetic needle was noted) there were ten hourly readings, except on the 1st and 15th of every month, when the readings were much more frequent. The magnetic inclination or dip was also observed, but the instrument was so poor that the value of the record is seriously impaired. Tidal observations, which promise to be of much value, were likewise made. Great pains were taken to secure accurate observations of the pendulum as a contribution to geodesy. Air samples were secured, but abandoned on the retreat. The velocity of sound at low temperatures was noted. Each day there were 526 recorded observations, — 264 magnetic, 234 meteorological, and 28 tidal. Careful memoranda were made upon the diet of the members of the party, and upon all the circumstances which tended to keep up their health; and the chapter on hygiene and routine is by no means

the least important in the volumes. Geological, paleontological, zoölogical, botanical, and ethnological facts were noted whenever there was opportunity to collect such information. On all these points the appendixes are very full.

It only remains for us to add that these volumes are printed in a most attractive manner, and that the illustrations and maps are abundant and satisfactory. In all respects the book is a credit to the author and the publishers. We purposely avoid here all comment on the cause of the sad failure to relieve at the appointed time the party, and all questions in respect to the imperfections of the outfit. There was a sad lack of thorough attention to some details, — a lack which has greatly impaired the satisfaction with which the expedition would otherwise have been regarded. But Greely and his brave comrades have borne their part nobly, and we trust that a grateful republic will ponder the words with which these volumes close, and act, through congress, before it is too late.

"No man of the party has received promotion, except such temporary advancement as my personal urging could secure. Two men, with broken health, have adventured their private fortunes; and one, a most self-sacrificing, soldierly, temperate, and loyal man, lies, as these lines are penned, helpless in a city hospital, aided by private charity, his pension not even awarded. Even the meagre allowances originally promised for arctic service have not been fully paid, and the widows of the dead are generally as yet unrecognized.

"Our great country in these days asks not in vain for its sons to venture their lives for any idea which may subserve its interests or enhance its greatness. I trust that posterity may never mourn the decadence of that indomitable American spirit which in this generation fought out to the bitter end its great civil war, and made it seem an easy thing in time of peace to penetrate the heart of Africa, to perish in the Lena Delta, to die at Sabine, or to attain the farthest north."

LONDON LETTER.

ALL friends of scientific education, as well as a wider circle, hail with the greatest satisfaction the appointment of Sir Lyon Playfair, the present president of the British association for the advancement of science, to the post which is practically minister of education under Mr. Gladstone's government, which has just been constituted. For many years Sir Lyon Playfair was chairman of committees of the house of commons, and at one time he held the position of postmaster-general in a former government. It is often re-

¹ Markham's highest point in 1876 was $83^{\circ} 20' 26''$.

marked, with some justice, that in the formation of an English government, from political and party considerations, the round men get put into the square holes, and *vice versa*. In the present appointment it is pre-eminently a case of the round man being fitted into the round hole. Probably no man in the house, with the possible exception of Sir John Lubbock, M.P. for the University of London, is listened to with more respect on educational questions than Sir Lyon Playfair.

Mr. D. Morris has been appointed to the post of assistant director of the Royal gardens, Kew, as successor to Prof. W. T. Thistleton Dyer, who became director on the resignation of Sir Joseph Hooker. Mr. Morris has spent some years in Jamaica as director of the public gardens and plantations, and has brought both the gardens at Kingston, and the cinchona plantations, to a very high state of efficiency.

Two new lectureships in biology have been lately established at the University of Edinburgh. The present occupant of the natural history chair is Prof. J. Corsar Ewart, whose work in connection with the fishery board for Scotland is well known; and Mr. George Brook, who has for some time past been making investigations upon fish ova for the same board, has been appointed as lecturer upon comparative embryology. Still more recently another lectureship has been endowed by Lord Rosebery. Mr. E. J. Romanes, F.R.S., has accepted the post, and in the course of the next five years will deliver thirty lectures on the philosophy of natural history. The University of Aberdeen is losing its professor of physiology, Dr. William Sterling having been called to Owens college, Manchester, as the successor of Dr. Gamgee, who is about to devote himself to professional work in a more southern climate than that of Manchester. Mr. Gilbert C. Bourne has just returned from the Chagos Archipelago, where he has been spending the last six months in zoölogical work. He has made extensive collections of the terrestrial fauna and flora, and also of the corals, some of which are probably new, while he has also devoted some time to embryological research.

At the last meeting of the Society of telegraph engineers and electricians, a very remarkable paper was read by the president, Prof. D. E. Hughes, F.R.S., as his inaugural address, on "Self-induction of an electric current in relation to the nature and form of its conductor." The researches were made with a combination of the author's induction-balance, with a Wheatstone bridge, called an 'induction bridge.' Among the practical points resulting from these researches may be mentioned a very decided verdict in favor of the ribbon form

of lightning conductor, a solid rod of iron being regarded by the author as the worst possible form. Another point hitherto little understood, but first pointed out by Mr. W. H. Preece at the Aberdeen (1885) meeting of the British association, was cleared up; viz., why, when an iron and a copper wire of equal resistance and static capacity were used for telegraphing between London and Newcastle, 278 miles, there was an increase of speed in the copper line of 12.9 per cent as compared with the iron. The discussion on this paper to-morrow evening is looked forward to with great interest. W.

London, Feb. 10.

NOTES AND NEWS.

IN order to give an opportunity for definite and systematic effort by all those who believe that our birds ought to be protected, the *Forest and stream* has recently founded the Audubon society. Membership in this society is to be free to everyone who is willing to assist in forwarding any one of the three objects for which it is established. These objects are to prevent so far as possible (1) the killing of any wild bird not used for food, (2) the destruction of the nests or eggs of any wild bird, and (3) the wearing of feathers as ornaments. The work to be done by the Audubon society is auxiliary to that which is being done by the American ornithologists' union committee, and will consist largely of matters of detail, to which this committee could not attend. The management of the society for the present will be in the hands of a member of this committee. Branches of this association will be established all over the country. The work of the *Forest and stream* is only preliminary. As soon as the society shall have attained a respectable membership, and be on a firm footing, it will be turned over to its members for final organization. In order that this may take place as speedily as possible, it is hoped that all interested in bird-protection will send in for membership their own names, as well as those of any others whom they think likely to assist. To all such, free circulars containing information will be sent for distribution. Names should be sent without delay to *Forest and stream*, 40 Park Row, New York, N.Y.

—The commission appointed to consider the question of consolidating several of the scientific bureaus of the government are progressing slowly with their work, and a report is not looked for within several months. It is authoritatively learned that the signal office is the chief obstacle in the way of any proposed change, and of an early settlement of this important question. A

strenuous effort will be made by those interested in this service, to prevent a consolidation, or any curtailment of its powers. The temper of the commission is decidedly in favor of consolidating some of the scientific bureaus, and a recommendation to this effect may confidently be looked for.

— It is proposed to establish a permanent exposition in Washington, preparatory to a world's exposition in 1893 to celebrate the fourth centennial of the discovery of America.

— A bill is now before congress to extend the reports of the signal service for the relief of farmers. It is proposed to forecast "cold waves, rains, storms, and marked inclemencies" of the weather, by establishing danger-signals at telegraph-stations all over the country.

— The exploration of the ancient mounds in Manitoba promises interesting results. It appears from surveys made during the past summer that the northern limits of the mound-builders lie beyond the Red River of the North. Along this river and Lake Winnipeg, mounds were found identical in structure with the famous ones of the Ohio and Mississippi valleys.

— An act of incorporation, establishing a zoölogical society in Washington, was passed in 1870; but nothing, so far, has been accomplished toward carrying into effect the provisions of its charter. Mr. P. T. Barnum now proposes to establish a zoölogical garden there, if congress will grant the use of thirty acres of the reclaimed lands on the flats for the purpose, and the privileges vested in this society. He offers to expend \$200,000 in improving and beautifying the garden.

— The mineralogical collection of Mr. C. S. Bement of Philadelphia is said, by Professor Rath of Germany, to be undoubtedly the most remarkable private one in existence. It is especially valuable for the richness and perfection of its rarer forms, and for its completeness of authentic species. It includes, according to Mr. Kunz, over 10,500 specimens.

— It appears that Columbia college was not the first to act upon the Tyndall scholarship (not 'fellowship'), as stated in the last issue of *Science*. Harvard college took action in regard to the matter nearly three months ago, and at that time appointed Mr. H. H. Brogan, of the class of 1885, as the first incumbent. He was in Europe at the time, and began his studies immediately.

— Jacob v. Tschudi, the well-known South American traveller, archeologist, and naturalist, died Jan. 25, at St. Gall, Switzerland, aged sixty-eight.

— Preparations for the international horticultural exposition at Dresden, Germany, which will be held next May, are progressing rapidly. The chief exhibition-hall will comprise nearly 24,000 square feet of space; and there will be, in addition, another building, with more than double the superficial area, to contain the more delicate plants.

— An interesting fact in connection with the trephining of an Inca skull, recently described in the Proceedings of the national museum, is recalled by Mr. J. W. Taylor of Roxbury, Mass., who states that Dr. Rink, during his travels in Labrador, recorded the story of an Eskimo family that lived near a people who built their houses of boulders. The latter were hostile to the Eskimo, and, when they took them prisoners, they put them to death by boring a hole in their foreheads with these stones.

— The importance of bacteriological studies has been recognized by the U. S. army and medical museum by the institution of extended laboratory work in the cultivation of the various forms and varieties of these microscopic organisms. Especial pains have been taken by Dr. Billings, the curator, to introduce all the latest methods and apparatus, so that the facilities are now quite equal to those of foreign laboratories. Solid culture media only are employed, as gelatine, blood-serum, potato, bread, and agar agar; and excellent results have been attained in the culture of the principal pathogenic forms. Many specimens are on exhibition, illustrating the germs of various diseases. The chromogenic forms are seen growing upon slices of potato, and represent almost every tint of the rainbow. The value of such laboratory work at the present time is unquestionably great.

— The entire number of books published in the United States during 1885, as compiled by the *Publishers' weekly*, amounts to 4,030, a decrease of about 50 from that of 1884. In education and language there were 225, a decrease of 2; medical science and hygiene, 188, a decrease of 21; social and political science, 163, a decrease of 5; physical and mathematical science, 92, a decrease of 42; mental and moral philosophy, 25, an increase of 6. The loss has been greatest in works on science and the useful arts, and the greatest gains were on religious, theological, and juvenile works. The largest number of works, 934, as usual, were of fiction, with theological, law, and juvenile books coming next, each with about 400.

— The Museum of hygiene at Washington contains a metallic burial-casket similar to that sent to Siberia to receive the body of Captain De Long, who perished at the Lena in October, 1881. These

caskets are designed to preserve the body in nearly a natural state by excluding the air. The body is surrounded with ground cork, and the lid of the casket is carefully cemented with white lead; it is then wrapped in a layer of thick felt, and placed in a tightly constructed pine case, which is completely filled with the ground cork. The seams of the pine box are carefully covered with white lead, and the whole is enveloped in another thick wrapping of felt; over the latter is a covering of burlap, secured by stout cords; outside is a pine crate. These caskets are believed to be the best ever made for the preservation of the dead; and the great success achieved in the transportation of the remains of De Long and his companions would seem to indicate their entire feasibility for general use in similar instances, or where bodies are to be transported long distances through many climatic changes.

— The herbarium of the national museum at Washington now embraces over 25,000 specimens, representing 17,000 species, and is established upon a broad basis, which admits of almost unlimited expansion. The North American flora is represented by about 7,000 species, contributed by Ward, Canby, Havard, and others, and is constantly increasing. The herbarium is also rich in European species, the gift for the most part of the authorities at Kew, and chiefly from the collections of George Curling Joad and J. Gay. This material, however, represents only a small portion of the national herbarium, the greater part of which is yet at the department of agriculture, where the government collections were formerly deposited before the erection of the national museum building. Case-room is provided, and the specimens are permanently mounted and systematically arranged according to the system adopted by Bentham and Hooker in their 'Genera plantarum.' The collection is rendered easily accessible by means of a card catalogue, and Roman and Arabic label numbers for order and genus on each genus-cover. The herbarium is placed in immediate connection with the department of fossil plants, and under the same curatorship. It is intended that all duplicate material shall represent either additional parts of plants or widely different localities, as illustrating their geographical range, local variation, etc. Other duplicates will, however, be utilized in effecting exchanges for species not represented.

— The *Berichte der deutschen botanischen gesellschaft* contains the interesting results of a number of experiments recently made by Strasburg upon the grafting of solanaceous plants. Jimson-weed (*Datura stramonium*) and 'wintercherry' (*Physalis*

alkengi) were ingrafted upon potato-stocks, with immediate union; and with the tobacco-plant less speedy though equally successful results were derived. Grafting deadly nightshade (*Atropa belladonna*) and henbane (*Hyoscyamus niger*) was accomplished with more difficulty. Other attempts also succeeded in ingrafting the potato upon the nightshade (*Solanum nigrum*), tobacco, and wintercherry, though with less ease. Not only were union and growth secured between these different solanaceous plants, but also between the potato and *Schizanthus Grahamei*, a Chilean scrophularian plant, upon which the potato-fungus grows. The development in this last, however, was feeble. In none of these experiments did there appear to result any modifying influence upon the stock. The potato produced tubers as usual, though there appears to have been a greater number of irregular forms. With the jimson-weed the tubers were well developed, but no seeds were produced. On the other hand, tobacco-plants fructified abundantly, with only a sparse growth of tubers. Reserve material does not seem to be sufficient to admit of both seeds and tubers together. Potato-plants grafted on others seemed to possess a superabundance of reserve material, however, resulting in the growth of tubers of the size of a walnut, in the axils of the leaves. The 'eyes' of these tubers, it is interesting to state, developed leaves of considerable size. This growth of tubers above ground has been previously observed in the potato-plant, where the stem had been crushed close to the surface.

LETTERS TO THE EDITOR.

**. Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

Sea level and ocean-currents.

ACCORDING to Zöppritz, the winds were thousands of years in overcoming the inertia of the water, and causing the present ocean-currents. Of course, during the latter part of this long period, after their effect had extended down to the bottom of the ocean, a part of their force was spent in overcoming the friction over the bottom, and toward the last a very small part only in accelerating the motion. But according to the same authority, after 239 years, while the whole force of the winds was spent upon the inertia of the water, only one-half the surface velocity was communicated to the stratum at the depth of 100 metres; and so at the depth of a few hundred metres there was yet very little velocity. The greatest surface velocities in the open sea, supposed to be due to the winds, are, on the average, not more than ten miles per day. The whole amount of momentum, therefore, caused by the action of the winds, is only about equal to that of a stratum 100 metres in depth, with a velocity of ten miles per day, the amount of momentum below 100 metres in depth being about necessary to reduce that above 100 metres to the mo-

mentum, corresponding to that of a uniform velocity of ten miles per day for all the strata. We can only judge of the force of the winds, as exerted upon the surface of the ocean, by the amount of momentum produced in a given time; and, from the small amount of momentum produced in so long a time, this force must be very small.

Let us now examine the effects of gravity as called into play by the gradients of the strata of equal pressure, arising from unequal upward expansions due to differences of temperature. Referring to my notes upon this subject, I make the following extracts from a larger table, in which the temperatures and the upward expansions are given for three stations at the given depths in the first column:—

DEPTHS IN FATHOMS.	EQUATOR.		LAT. 23° 2' N. LONG. 38° 7' W.		LAT. 37° 9' N. LONG. 41° 7' W.	
	Temp.	Expan.	Temp.	Expan.	Temp.	Expan.
0	25°.5C.	5.1ft.	22°.2C.	7.8ft.	21°.1C.	8.5ft.
50	17.7	3.9	—	—	—	—
100	13.1	3.2	19.4	5.8	17.5	6.7
200	8.1	2.8	14.8	4.6	15.9	5.2
300	5.7	2.4	11.4	3.6	15.6	4.0
400	4.6	2.0	8.7	2.8	12.7	3.0
500	3.8	1.8	6.5	2.3	8.2	2.3
600	4.0	1.6	5.4	2.0	5.3	1.9
700	3.9	1.4	4.8	1.8	4.8	1.7
800	3.9	1.2	4.1	1.6	3.4	1.6
900	3.4	1.1	4.0	1.5	3.2	1.5
1000	2.7	1.0	3.5	1.4	3.2	1.4
1500	2.3	0.6	2.6	0.9	2.7	0.9

The temperatures are the means of six soundings of the Challenger expedition, as given by Dr. Croll; and the upward expansion, computed from Dr. Hann's formula for the density of sea-water, is that arising from the differences of temperature at the different depths, and that of the maximum density of sea-water in the polar regions. The temperatures at the bottom of the stations, ranging in depth from 2,500 to 2,700 fathoms, were a little less than 2°. The upward expansion of the surface at the equator is a little greater than that of Dr. Croll (4.5 feet), obtained by means of Muncke's tables, but the difference is of no consequence.

It is seen that the temperatures and upward expansions diminish rapidly near the surface, and that the latter are small in the lower depths. Supposing, for simplicity, that the gradients are uniform from the equator to the latitude of maximum density, say 5,000 miles from the equator, then the average gradient of the whole mass of the ocean, down to the depth of 2,500 fathoms, is about 1.5 feet in 5,000 miles, instead of 5.1 feet, as at the surface. The force, therefore, down this average gradient, of the whole mass, is to that of gravity about as unity is to 18,000,000. It is readily found, from computation, that this force down this small gradient would give to the whole mass, in four days, a velocity of ten miles per day. According to Zöppritz, the whole action of the winds in 239 years produced only this amount of velocity on a surface stratum of 100 metres in depth, say one-fiftieth part of the whole depth. To produce an amount of momentum, therefore, equal to that of the whole ocean, with a velocity of ten miles per day, would require nearly 12,000 years. Comparing, now, four days with 12,000 years, we get an approximate idea of the relative strengths of the two forces, for these must be inversely as the times required to produce a given amount of momentum.

The force of the winds upon the ocean, therefore, in comparison with the gravitation force, is almost infinitely small, if Zöppritz's results are to be accepted. But I have never accepted these, and therefore regard this simply as a very strong *argumentum ad hominem* on the subject to anyone who accepts them, and also maintains that the winds have any sensible effect in causing ocean-currents. Of course, a very small force, with time enough, will produce any given amount of momentum; and so the winds, in time, could have caused an amount of motion equal to that observed in the ocean, if no other forces had been in operation; but with other forces many times greater, causing both vertical and horizontal circulations, of course the effects of the infinitely small force would be entirely lost.

In the flowing of rivers down a gradient, knowing the gradient and the mass, we have a measure of the force required to overcome the friction; and thus, from the known depth and velocity, it is easy to obtain approximately the value of the friction-constant. From any considerations of this kind I have never been able to obtain a friction-constant nearly so small as that assumed by Zöppritz, and therefore think it is many times too small as applied to rivers or ocean-currents.

If we assume that the winds can cause the given amount of momentum in one year, instead of 12,000, we still have their force upon the ocean nearly 100 times less than the gravitation force; and I think good judgment in the matter would decide that a year, at least, would be required for the slight action of the gentle winds blowing over the ocean to give an amount of momentum equal to that of the whole mass, with a velocity of ten miles per hour. I cannot think, therefore, that the effect of the winds is more than one-hundredth part of that of the gravitation force.

Professor Davis seems to think that the gravitation force is too small, even allowing it a long time to act, to move the whole mass of the ocean. But the greatest tidal gradients with reference to the results of gravitation and lunar forces, are little, if any, greater than that of fifteen feet in 5,000 miles; yet these move the whole mass of the ocean to the bottom back and forth twice a day, causing regular elevations and depressions of the surface, now high water, and six hours after, low water. The maximum tidal velocities for all depths amount to a velocity of nearly a mile per day. I do not think a quarter-diurnal reversal of the directions of the winds would give rise to reversed velocities of that amount to a stratum of the depth of ten metres; and so the effect of the winds would be about 150 times less than that of the tidal forces, which are about the same as those of the gradients arising from the differences of temperature.

The regular gradients from the equator to the polar regions must be regarded as the initial ones, and consequently the forces arising from them, as the forces which overcome the inertia of the water before the final motions have been fully established. But the directions of the initial motions are very much modified by the deflecting forces of the earth's rotation, and the distribution of the temperature disturbances somewhat changed. An interesting example of this kind is indicated by the temperatures of the last two stations of the preceding table, from which it is seen, that, in the region of the Sargossa Sea, the high temperatures extend down to greater

depths, and the consequent upward expansions are greater. This is caused by the gyratory motion of the water around this region. The deflecting force of the earth's rotation arising from this motion, being on all sides to the right of the direction of motion, drives the surface water, together with the seaweed from all sides, into this region; so that there is a little heaping-up of the water in this region above that caused by the greater upward expansion: and this causes a settling-down and a flowing-out at all sides below, where the gyratory velocity, on account of greater friction, is less, and the consequent inward pressure toward the central part less, than they are above. This carries the warm surface water downward, and makes the average temperature for all depths and the upward expansion greater here than in the surrounding parts; and this, together with the slight accumulation of the mass in the region of the Sargossa Sea, raises its level several feet.

Where wind drives the water against a barrier or shore, as in the case of Lake Ontario or the Atlantic Ocean, regular progressive currents from top to bottom in the same direction cannot be established; but the surface water which is driven forward must return below, or at the sides if the wind blows over the middle part only. In such cases the greatest change of sea-level takes place soon after the winds begin to blow in any given direction, while the whole force is spent upon a comparatively thin stratum. It is well known that winds blowing over a very shallow stratum of water, or along the length of a very shallow canal, may produce a considerable change of level; whereas, if the depth were considerable, the change would be but little. At first, while the whole force of the wind is spent upon the surface water of a lake or ocean, the great body of undisturbed water below is the same as so much solid matter. But after the surface water has been driven to one side, and the pressure there increased, which gives rise to the return current below,—when this has been fully established, the difference of sea-level at the two sides or ends, from and to which the wind blows, is less.

W. FERREL.

Washington, D.C., Feb. 12.

The Davenport tablets.

Please allow me to trouble you once more, and finally, in reference to the Davenport tablets.

Mr. Putnam says, "If Professor Thomas will take the Grave Creek tablet, or even the famous Rosetta stone, and sit down before them with his Webster's 'Unabridged,' he will find no end of similar resemblances." Very true, as the alphabets used on the Rosetta stone are some of those given by Webster, and the characters on the Grave Creek tablet have been taken from half a dozen different alphabets, which is one of the chief reasons why it is generally rejected by modern archeologists (see Dr. Wilson's scathing criticism in his 'Prehistoric man,' third edition, vol. ii. pp. 99-111).

Mr. Putnam's criticism of Mr. Tiffany's letter, on account of illiteracy, is in strange contrast with the records of the Davenport academy, which show that Mr. Tiffany was one of its four original organizers (Proc., vol. vi. p. 1), was a member of the museum committee, was one of the board of trustees named in the constitution and articles of incorporation, was a member of the committee on finance (Proc., vol. i. pp. 4, 7, and 8), was more than once selected as one

of a committee of three to draught resolutions (Proc., vol. i. pp. 23 and 71), was one of a committee of two appointed to take steps toward erecting a building, was for some years treasurer of the academy (Proc., vol. i. p. 67), and did considerable mound-exploring, for which special credit is given in the president's annual address of 1876.

It is true that in the letter, from which I quoted only so much as touched upon the points then under discussion, Mr. Tiffany expresses entire confidence in the shale tablets, which is proof that his expression of doubt in regard to the 'limestone tablet' was not for the purpose of 'defaming his old associates,' but because the evidence satisfied him it was a plant.

In answer to Mr. Putnam's singular philosophy respecting the entrance of water into the little vault where the limestone tablet was found, it is only necessary to refer to the figure and description of mound 11, heretofore given. As neither cement, plastering, clay, nor mortar was used, it would have been, as every mound-explorer knows, a miracle if water had failed to enter the vault, and, in the course of centuries, fill it with dirt. Moreover, in the course of time the superincumbent weight would have pressed the slab which covered the vault down upon the tablet.

Archeologists, so far as they have spoken, have, almost without exception, indicated in their published works a want of faith in these tablets. Short, in his 'North Americans of antiquity' (p. 40), says, "The above conjectures as to the significance of the representations on these tablets are based upon the supposition that they are genuine, and not the work of an impostor, of which we cannot refrain from expressing a slight suspicion." Rev. J. P. MacLean, speaking of the cremation scene, says, "Among the cabalistic characters, the word 'town' stands out in bold lines, and the figure '8' appears in rude shape among other marks. The picture of a face occurs in the sun, resembling the face of a European. The artist has overdone his work: it needs no further investigation" ('Mound-builders,' p. 116). Yet Mr. MacLean is one of two (Dr. Willis De Haas is the other), of whom Mr. Putnam remarks in his recent annual address to the academy, as published in the local papers, "There are thus no more competent archeologists in the country." Mr. Peet, in the *American antiquarian* of July, 1878, expresses the same opinion as Mr. MacLean. Prof. M. C. Read, in the *American antiquarian* of April-July, 1882, expresses a doubt as to their authenticity, based upon the characters they bear. Dr. E. Schmidt, in an article entitled 'The mound-builders and their relation to the historical Indians' (*Kosmos*, 1884, p. 146), remarks, "It is hardly necessary to be pointed out that none of the notorious tablets are without suspicion, and that all which have been subjected to earnest investigation have turned out to be gross forgeries." It appears from these notices that I am not alone in expressing doubt as to the authenticity of these tablets.

Notwithstanding the kind invitation of the academy to visit their museum and inspect the tablets, I preferred, for the present, to base my arguments on the publications of the academy (the albertypes included) and the statements of its members, as this avoided recourse to personal judgment, and appealed only to what is before the public. Even the extracts from Mr. Tiffany's and Mr. Pratt's letters were in

confirmation of Mr. Harrison's published account of the finding of the limestone tablet. If this evidence leads to the conclusion that these relics are modern productions, as I believe it does, there is no necessity for the present of 'further investigation,'—a conclusion Mr. MacLean seems to have reached while writing his 'Mound-builders.' CYRUS THOMAS.

The claimed wheat and rye hybrid.

In *Science* of Jan. 15 appears an article from Dr. Sturtevant, which, to save words, I will call a criticism of an account of my rye and wheat hybrids, published in the *Century magazine* of last January by Charles Barnard. Mr. Barnard, after an examination of the plants at my place last summer, gives their history, accepting, without question, their hybrid origin. Dr. Sturtevant, who also examined them last summer, begs to dissent. He considers the evidence adduced only 'sufficient to establish grave doubts.'

While we were on our way to the plots, Dr. Sturtevant remarked that he wanted me to know that he was 'incredulous as to the whole thing.' While we were returning, he said, "I am convinced that they are hybrids, but I question whether they will not be found to be distinctly either wheat or rye." In the *Science* article referred to, he next states that he has compared the pictures of a few of these heads which appeared in the *Rural New-Yorker* with those of five old varieties which he mentions, and finds them closely alike. Then he remarks that he does not question the 'attempt at a cross.' The 'variability effected is,' he admits, 'indicative of a foreign pollen.' This variability, which he believes not to be due to hybridization, the doctor explains by an 'hypothesis.' It is that under the stimulus of the rye pollen, atavism has resulted, whereby varieties dormant in the wheat (female) plant have made their appearance. Finally he expresses the hope that some one, expert in agricultural botany, may 'investigate a series of these specimens.'

Dr. Sturtevant, though he states that he has carefully studied the 'published claims,' has apparently overlooked the published fact that specimens of these hybrids have been sent to no less than six well-known botanists, several of whom have replied that they were evidently hybrids, while others replied to the effect that the hybridization was a most interesting fact, etc.

Now, if we emasculate the florets of a head of wheat while the anthers are immature, and repeatedly apply rye pollen, and thus succeed in attaining ten grains, from which, in three years, at least fifty different varieties appear, differing as widely as any known wheats differ from each other, while some of them resemble rye more than wheat, can anyone reasonably doubt that a hybridization was effected? Why assume anything else whatever? What does Dr. Sturtevant mean by ascribing such changes to the 'stimulus of foreign pollen' as something different from the sexual effect of foreign pollen? Suppose atavism is shown in some of these: does it not prove, all the same, that hybridization was effected? A hybrid may show all, some, or none of the characteristics of either parent, and still be a hybrid, as has often been revealed in the later seedling progeny.

In drawing resemblances between the pictures in the *Rural New-Yorker* and those of which he speaks,

the doctor, very likely, forgets an important fact; viz., that in many of the heads of the plants most resembling rye, the spikelets bear but two kernels, while many are wholly abortive. Again: the botanical relationship is marked not only by narrower glumes, by fewer florets and grains, but by the fact that the culms beneath the head for an inch or so are hairy,—a characteristic that never occurs on wheat culms. The color of both the culms and leaves is also distinctly lighter (more glaucous) than that of wheat, and the habit of the young plant is that of rye. E. S. CARMAN.

A recent ice-storm.

The trees in central Massachusetts, along the line of the Boston and Albany railroad from Worcester to Spencer, suffered severely from the weight of ice formed upon them during the storm of Feb. 11-13, that caused the recent destructive floods. It was noticeable that the trees which exposed the largest surface for the attachment of ice did not suffer most: the pines with their green needles, and the oaks with their dead leaves, generally escaped injury; and the slender birches were saved by bending instead of breaking. But from five to twenty per cent of the other deciduous trees were more or less hurt. The side limbs were not often broken: it was nearly always the vertical top-stems that sustained the most injury, apparently because their natural position was farthest from that into which the weight of the clinging ice forced them.

Can some of your readers furnish direct observational evidence to show why the pines and leafy oaks escaped, while the bare trees were so much damaged?

W. M. DAVIS.

Cambridge, Feb. 20.

Corrections of thermometers for pressure.

If any of your readers interpreted our reference in *Science*, Feb. 12, to a letter from the signal office, as your correspondent, Sig., feared they might do, we regret it, and are glad that the import of that letter has been fully explained. We are well aware that many of our text-books on heat refer to the effect of pressure on the thermometer, and state how to prevent it in some instances. The effect of appreciable changes of pressure on the thermometer seemed to us to be sufficient to demand correction in all accurate thermometric work. If such corrections are generally made, they are omitted in the report of experiments.

F. P. VENABLE.

J. W. GORE.

University of North Carolina, Feb. 22.

Is the dodo an extinct bird?

Referring to Dr. Shufeldt's article (*Science*, vii. 145) respecting the supposed present existence of the dodo, it may be desirable to state, for the benefit of those who are not already aware of the fact, that the so-called dodo from Samoa, mentioned in the clipping 'from an English newspaper,' is not the dodo at all, but the dodo-pigeon, *Didunculus strigirostris*, a living specimen of which was last year presented to the national museum by Dr. T. Canisius, ex-consul of the United States at Samoa. This specimen was, at latest account, thriving in the zoölogical garden at Philadelphia.

ROBERT RIDGWAY.

Smithson. inst., Feb. 15.

SCIENCE.—SUPPLEMENT.

FRIDAY, FEBRUARY 26, 1886.

THE PRESENT WHOLESALE DESTRUCTION OF BIRD-LIFE IN THE UNITED STATES.

IN the bird-world, as elsewhere, the struggle for existence, even under natural conditions, is a severe one, undue increase being held well in check. Birds, and their eggs and young, are not only the natural prey of many predaceous mammals and reptiles, but also of predaceous birds. Squirrels, spermophiles, and mice, although not in a strict sense rapacious, are among the worst natural enemies of the smaller birds, whose eggs and young they seek and devour with avidity; while many birds not usually classed as predatory, as the jays, crows, grackles, cuckoos, and some others, wage unremitted warfare upon the eggs and young of the weaker species. The elements are also far more destructive of bird-life than is commonly recognized. Late cold storms in spring destroy many of the early migrants, sometimes nearly exterminating certain species over considerable areas where they had become prematurely settled for the season. The unusual southward extension of severe cold waves and heavy snow-falls, such as have marked the present winter, are destructive to the bird-life of the regions thus exceptionally visited. During the migrations, both in the fall and spring, immense numbers of birds are sometimes caught by storms, and blown far out to sea and drowned, or perish in attempts to cross the larger inland lakes. There is abundant evidence to show that the annual destruction of birds by the elements alone must prove a severe check upon their increase. But all this is a part of nature's routine, which has characterized past ages as well as the present, and which, so far as we know, may be only the natural and necessary check upon undue increase. It is only when man comes upon the scene that nature's balance is seriously disturbed.

Man's destructive influence is to some extent unavoidable, but in far greater part selfish and wanton. The removal of forests, the drainage of swamps and marshes, the conversion of wild lands into farms, and the countless changes incident to the settlement of a country, destroy the haunts and the means of subsistence of numerous forms of animal life, and practically result in their ex-

termination over vast areas. The birds, particularly the larger species, suffer in common with vertebrate life in general. Electric-light towers, light-houses, and light-ships are also a fruitful and modern source of disaster to birds, particularly during their migrations, when, in thick weather, thousands upon thousands kill themselves by dashing against these alluring obstructions. Telegraph-wires contribute also largely to the destruction of bird-life. While the destruction by these agencies is greatly to be regretted, it is not directly chargeable to cupidity and heartlessness, as is the far greater slaughter of birds in obedience to the dictates of fashion, presently to be detailed.

The history of this country, as is well known, is the record of unparalleled destruction of the larger forms of animal life. Much of this destruction, it is true, was unavoidable, sooner or later. But it is no less true that the extirpation of our larger game animals has been needlessly hastened by what may be fairly termed a disgraceful greed for slaughter, — in part by 'pot-hunting' on a grand scale, in part for the mere desire to kill something, — the so-called 'love of sport.' The fate of extermination, which, to the shame of our country, has already practically overtaken the bison, and will sooner or later prove the fate of all of our larger game-mammals and not a few of our game-birds, will, if a halt be not speedily called by enlightened public opinion, overtake scores of our song-birds, and the majority of our graceful and harmless, if somewhat less 'beneficial,' sea and shore birds.

The decrease in our song and shore birds is already attracting attention; and the protest against it, which reaches us from many and widely distant parts of the country, is not only painful evidence of this decrease, but gives hope that the wave of destruction, which of late years has moved on in ever-increasing volume, has at last reached its limit of extension, and that its recession will be rapid and permanent. But to secure this result, the friends of the birds — the public at large — must be thoroughly aroused as to the magnitude of the evil, and enlightened as to its causes and the means for its retrenchment. It is therefore the purpose of the present series of papers to throw some light upon the extent, the purposes, and the methods of the present wholesale slaughter of our native birds.

Birds are killed for food, for 'sport,' for natural-

history specimens, to stuff as objects of curiosity or ornament, and for personal decoration. The birds killed for food are, of course, mainly the commonly so-called game-birds, — pigeons, grouse of various kinds, ducks and geese, and the great horde of smaller waders, known as 'peeps,' snipes, plovers, rails, etc. The slaughter of these has been so improvident, and their decrease of late so marked, that they are now more or less cared for by the numerous game-protective associations, but are still, in the main, very inadequately guarded. In addition to the birds commonly recognized as game-birds, many song-birds are hunted for food, notably the reed-bird, or bobolink, the robin, the meadow-lark, the blackbird, and the flicker, and, in some localities, all the larger song-birds. This is particularly the case in portions of the south, where strings of small birds may be seen suspended in the game-stalls. In March of last year, a well-known ornithologist reports finding in the market at Norfolk, Va., hundreds of woodpeckers and song-birds exposed for sale as food, the list of species including not only robins, meadow-larks, and blackbirds, but many kinds of sparrows and thrushes, and even warblers, vireos, and wax-wings. While some of the stalls had each from three hundred to four hundred small birds, others would have but a dozen or two. "Nearly all the venders were colored people, and doubtless most of the birds were captured by the same class." This 'daily exhibition in southern markets' indicates an immense destruction of northern-breeding song-birds which resort to the southern states for a winter home.

As shown in a subsequent paper of this *Supplement*, the eggs of many species of terns, gulls, plovers, and other marsh and shore breeding species, are systematically taken for use as food, the egg-hunting business being prosecuted to such an extent as to prove a serious cause of decrease of the species thus persecuted, while the value as food, of the eggs thus destroyed, is too trivial to be for an instant regarded as of serious importance. The havoc described below by Mr. Sennett as wrought in Texas prevails all along our coast-lines; and many localities might be cited where the destruction is equally sweeping, as on the Pacific coast and at frequent points on the Atlantic coast from Florida to Labrador, — wherever, in fact, the birds occur in sufficient numbers to render such wholesale plundering practicable. The marsh-breeding rails are at some localities subject to similar persecution. At one locality on Long Island, I am informed, a 'bay-man,' who keeps a house of entertainment for sportsmen during 'the season,' supplies his table for weeks at a time with the eggs of the rails that breed numerous in his vicinity,

— in strange conflict, too, with his own interests, since, by destroying the eggs of the rails, he 'kills the goose that lays the golden egg' for the rail-shooting season.

In general, the game and quasi-game birds are killed for sport rather than for gain or for their intrinsic value as food: exception, however, is to be made of the 'professional' or 'market' gunners, by whom the ranks of the water-fowl are so fearfully thinned, and who often resort to any wholesale method of slaughter their ingenuity may be able to devise. But the slaughter of our birds in general is doubtless largely due to the mere fascination of 'shooting.' Many song-birds are killed 'for sport' by the 'small boy' and the idler, whose highest ambition in life is to possess a gun, and whose 'game' may be any wild animal that can run or fly, and wears fur or feathers. Some slight depredation on the small fruits of the garden, or on field-crops, is ample pretext for a war of extermination on robins, catbirds and thrashers, jays and chewinks, as well as black-birds and crows, and the birds so unfortunate as to fall into the category of hawks and owls, notwithstanding the fact that every one of these species is in reality a friend. Yet the slaughter is winked at, if not actually encouraged, by those who are most injured by it; while the 'general public' of the districts where such practices prevail are either too ignorant of the real harm done, or too apathetic, to raise any serious protest.

Among the important agencies in bird-destruction is the 'bad small boy' — and in the ornithological sense his name is legion — of both town and country. Bird-nest robbing is one of the besetting sins — one of the marks of 'natural depravity' — of the average small boy, who fails to appreciate the cruelty of systematically robbing every nest within reach, and of stoning those that are otherwise inaccessible. To him the birds themselves, too, are also a fair target for a stone, a sling, a catapult, or a 'pea-shooter:' to the latter many a sparrow, a thrush, or warbler falls a victim. Says a recent writer on the subject of bird-destruction, "Two ten-year-old lads in that quiet and moral hamlet [Bridgehampton, Long Island] confessed this autumn, that with pea-shooters they had killed during the season fifty robins and other birds which frequent the gardens, orchards, and cemetery. Such boys exist all over the United States, and war on birds as things made to be killed. . . . The pea-shooter gives no sound, and can be carried in the vest-pocket; but so destructive is it in the hands of a skilful child, that the legislatures of some of the western states were obliged to pass laws making

the sale of the thing a misdemeanor, and punishing the possession or use of it."

Perhaps equally, possibly more destructive, and certainly more reprehensible, is the newly-arrived 'foreign-born citizen,' who, to demonstrate to himself that he has really reached the 'land of the free,' equips himself with a cheap shot-gun, some bird-traps, clap-nets, or drugged grain, one or all, and hies himself to the nearest haunt of birds for indiscriminate, often very quiet, slaughter or capture. Of course, only a few of our guests from foreign shores either possess or indulge in this propensity; but in the neighborhood of our larger cities, notably on Long Island, and elsewhere near New York, the destruction of bird-life thus effected, we are credibly informed, is startlingly large.

The destruction of birds by taxidermists, and for alleged 'scientific purposes,' has justly attracted attention, and has unjustly brought into disrepute the legitimate collecting of both eggs and birds for scientific use; but much of this alleged scientific collecting is illegitimate, being really done under false colors, or wrongly attributed to science. Of the birds killed or mounted by taxidermists, some, not unfrequently a large part, are for museums or private cabinets: another large share is put up for parlor or hall ornaments, either as groups or singly. All this, by a little license, may be allowed as legitimate, or at least not seriously reprehensible. But, unfortunately, the average taxidermist has too often an unsavory alliance with the milliner, and, in addition to his legitimate work, is allured into catering on a large scale to the 'hat-trade.' Although a few of them are too high-principled and too much the naturalist at heart, to thus prostitute their calling, taxidermists as a class are at present in deserved disrepute, and are to a large degree responsible for much of the public and mistaken criticism of scientific collecting. This criticism is perhaps more especially directed against the 'egg-collector,' who ranges in calibre and purpose from the schoolboy, who gathers eggs as he does postage-stamps or 'show-cards,' — for the mere purpose of 'making a collection,' — to the intelligent oölogist or ornithologist, who gathers his eggs in sets, prepares them with great care, with the strictest regard to correct identification, and in series sufficient to show the range of variation — often considerable — in eggs of the same species, and takes a few additional sets for exchange. He may have in the aggregate a large collection, numbering hundreds of species, and thousands of specimens; but in general the same species is not laid under serious requisition, and the sets are gathered at considerable intervals of time and from a large

area of country. A squad of street-urchins set loose in the suburbs will often destroy as many nests in a single morning's foray as a collector gathering for strictly scientific purposes would take in a whole season, and with far more harmful results, because local and sweeping. Much of the egg-collecting by schoolboys should be stopped, and can be easily checked under proper statutory regulations, as will be explained later in a paper on bird-legislation.

The scientific collector, as already intimated, is charged, in some quarters, with the 'lion's share' of the responsibility for the decrease of our song-birds; with what justice, or rather injustice, may be easily shown, for the necessary statistics are not difficult to obtain. The catalogue of the ornithological department of the national museum numbers rather less than 110,000 bird-skins. This record covers nearly half a century, and the number of specimens is four times greater than that of any other museum in this country; while the aggregate number of all our other public museums would probably not greatly exceed this number. But to make a liberal estimate, with the chance for error on the side of exaggeration, we will allow 300,000 birds for the public museums of North America, one-half of which, or nearly one-half, are of foreign origin, or not North American. To revert to the national museum collection, it should be stated, that, while only part of the specimens are North American, — say about two-thirds, — they represent the work of many individuals, extending over a third of a century, and over the whole continent, from Alaska and Hudson Bay to Mexico and Florida, and from the Atlantic to the Pacific. Furthermore, this number — 110,000, more or less — is not the number now in the national collection, which is far less than this, thousands and thousands of specimens having been distributed in past years to other museums in this country and abroad.

So far the public museums: now in relation to private cabinets of bird-skins. Of these it is safe to say there are hundreds scattered throughout the country, containing from three hundred to five or six hundred specimens each, with a few, easily counted on the fingers of the two hands, if not on a single hand, numbering five or six thousand each, with possibly two approaching ten thousand each. Probably 150,000 would be a liberal estimate for the number of North American bird-skins in private cabinets, but, again to throw the error on the side of exaggeration, let us say 300,000, — not, however, taken in a single year, but the result of all the collecting up to the present time, and covering all parts of the continent. Add this number to the number of birds in our

public museums, less those of foreign origin, and we have, allowing our exaggerated estimates to be true, less than 500,000 as the number of North American birds thus far sacrificed for science. The few thousand that have been sent to other countries in exchange for foreign birds can safely be included under the above estimate, which is at least a third above the actual number.

We have now passed briefly in review all the agencies and objects affecting the decrease of our birds, save one, and that the most important — many times exceeding all the others together, — the most heartless and the least defensible, namely, the sacrifice of birds to fashion, for hat ornamentation and personal decoration. Starting as this assertion may seem, its demonstration is easy.

In this country of 50,000,000 inhabitants, half, or 25,000,000, may be said to belong to what some one has forcibly termed the 'dead-bird wearing gender,' of whom at least 10,000,000 are not only of the bird-wearing age, but — judging from what we see on our streets, in public assemblies and public conveyances — also of bird-wearing proclivities. Different individuals of this class vary greatly in their ideas of style and quantity in the way of what constitutes a proper decoration for that part of the person the Indian delights to ornament with plumes of various kinds of wild fowl. Some are content with a single bird, if a large one, mounted nearly entire: others prefer several small ones, — a group of three or four to half a dozen; or the heads and wings of even a greater number. Others, still, will content themselves with a few wings fancifully dyed and bespangled, or a wreath of grebe 'fur,' usually dyed, and not unfrequently set off with egret-plumes. In the average, however, there must be an incongruous assemblage made up of parts of various birds, or several entire birds, representing at least a number of individuals. But let us say that these 10,000,000 bird-wearers have but a single bird each, that these birds may be 'made over' so as to do service for more than a single season; and still what an annual sacrifice of bird-life is entailed! Can it be placed at less than 5,000,000? — ten times more than the number of specimens extant in all our scientific collections, private and public together, and probably a thousand times greater than the annual destruction of birds (including also eggs) for scientific purposes.

Fortunately, perhaps, the supply of bird-skins for decorative purposes is not all drawn from a single country, the whole world being laid under tribute. The ornithologist recognizes in the heterogeneous groups of birds on women's hats, met with on every hand, a great preponderance of

North American species; but with them are many of the common birds of Europe, and a far greater variety from South America, and many from Africa, Australia, New Guinea, and India. But, on the other hand, it is well known that our own birds are exported in immense numbers to Europe; but, whether the exportation exceeds the importation, it is impossible to determine, from lack of proper statistics.

With the foregoing facts before us in regard to the annual destruction of our birds, it is no longer surprising that many species, and even genera, of birds, are fast disappearing from our midst. Considering that this slaughter has been waged for years, but with rapid increase year by year, is it not rather a wonder that so many birds are still left?

The extent to which this destruction is carried on, and in what ways, in the immediate vicinity of New York, is indicated in a subsequent article of this series, by Mr. Dutcher. But the slaughter extends in greater or less degree throughout the country. The destruction of 40,000 terns in a single season on Cape Cod for exportation, a million rails and reed-birds (bobolinks) killed in a single month near Philadelphia, are facts that may well furnish food for reflection. The swamps and marshes of Florida are well known to have recently become depopulated of their egrets and herons, while the state at large has been for years a favorite slaughter-ground of the milliner's emissaries. The present winter parties organized and equipped in this interest are said to be prosecuting the same wholesale warfare against the birds at various points along the whole gulf-coast.

But why, some may be supposed to ask, should the slaughter be interfered with? Does it not yield profit to many an impecunious idler, who receives so much per head from the 'taxidermist' for the freshly killed bird? Do not their preparation and manufacture into the gaudy or otherwise untasteful hat-gear give employment to many a needy hand, and add materially to the milliner's gains? Why is not their use for personal decoration, *à la sauvage*, as legitimate and defensible as their use for food, with the added advantage of being able to utilize decoratively a great many species otherwise of no commercial value? Why should we be anxious to preserve our birds? Are they, when alive, of any practical value, or do they contribute in any way to our pleasure or well-being?

In regard to the first of these inquiries, the men and boys really get little more in the average for the raw material than enough to pay them for their powder and shot: it is the 'sport' that

affords them their real reward. The middle-men, — the skimmers and manufacturers, — and an occasional professional gunner, make most of the profit, which must be more or less considerable to induce them to run the gauntlet of public opinion and the occasional risks of prosecution in their illegal enterprises. The milliner shares, of course, in the profits of the trade in such supplies; but, if birds were not used to such an extent, other and more fitting decorations would be adopted in their place, and their business would not suffer.

Respecting the latter inquiries, birds may be said to have a practical value of high importance and an aesthetic value not easily overestimated. Birds in general are the friends of man, and it is doubtful whether a single species can be named which is not more beneficial than harmful. The great mass of our smaller birds, numbering hundreds of species, are the natural checks upon the undue multiplication of insect-pests. Many of them rarely make use of other than insect-food, while all, as shown by scientific investigations already made, depend largely or wholly, during considerable periods of the year, upon an insect-diet. Even the ill-reputed hawks and owls prey upon field-mice, grasshoppers, and other noxious insects or vermin, some never molesting the farmer's poultry, and others only exceptionally. In the present general summary of the subject, it may be sufficient to say, that, while the beneficial qualities of birds vary widely with the species, none can be set down as proven to be unmitigatedly injurious. With the decrease of birds at any point is noted an increase of insects, especially of kinds injurious to agriculture. The relation of birds to agriculture has been studied as yet but imperfectly; but results could be cited which would go far to substantiate the above statement of their general utility. It is a matter for congratulation, that the investigation of the subject has now been systematically entered upon by the department of agriculture at Washington, under the supervision of experts especially fitted for the work.

Birds, considered aesthetically, are among the most graceful in movement and form, and the most beautiful and attractive in coloration, of nature's many gifts to man. Add to this their vivacity, their melodious voices and unceasing activity, — charms shared in only small degree by any other forms of life, — and can we well say that we are prepared to see them exterminated in behalf of fashion, or to gratify a depraved taste? Says a recent writer, "A garden without flowers, childhood without laughter, an orchard without blossoms, a sky without color, roses without perfume, are the analogues of a country without song-birds.

And the United States are going straight and swift into that desert condition."

Indeed, as previously noted, there is already an encouraging recognition of that fact. Here and there bird-protective associations are being formed, and more care is taken to secure proper bird-protective legislation; but the public at large is still too apathetic, or too ignorant of the real state of the case, to insist upon, and support by proper public sentiment, the enforcement of legislative acts already on our statute-books. The American ornithologists' union has moved in the matter by the appointment of a large and active committee on bird-protection, which is at present bending its energies toward the diffusion of information among the people, in the hope of awakening a healthy sentiment on the subject, and is also working to secure not only more effective and intelligent legislation, but the proper enforcement of the laws enacted in behalf of birds. This, too, notwithstanding a recent writer in a popular magazine characterized ornithologists as being among the worst enemies birds have, and to whose egg-collecting and bird-stuffing propensities was principally attributed the woful decrease of our song-birds!

In England the same rage for hat decoration with dead birds has gone so far that anti-plumage-wearing societies have already been established by the more intelligent women of that country; and it has already been suggested, apparently independently of any similar action abroad, by ladies themselves, that the women of this country throw their influence in a similar way against the barbarous custom of using birds for personal decorations. Much could doubtless be done in behalf of the birds in this way; for, once let it come to be considered vulgar and in 'bad form' to thus decorate one's person, and the power of fashion would be a mighty weapon in defence of the birds.

Of all the means that may be devised for checking the present wholesale bird-slaughter, the awakening of a proper public sentiment cannot fail of being the most powerful. Without this, all other means would prove, to a great degree, ineffectual. Laws, however good, cannot be enforced unless backed by public opinion. To arouse this, it seems only necessary to enlighten the community respecting the nature, the enormity, and the leading cause of this great evil. The following articles are intended to amplify and elaborate points merely hinted at in this general statement — to give a bill of particulars for certain special localities, and of certain phases, of this great slaughter of the innocents, and to show the methods adopted by some of the miscreants engaged in it.

J. A. ALLEN.

DESTRUCTION OF BIRDS FOR MILLINERY PURPOSES.

It is difficult to gather the actual statistics of bird-slaughter for millinery purposes, since it can be done only at the expense of much time and labor. We see on every hand—in shop-windows, on the street, in the cars, and everywhere where women are seen—evidence of its enormous extent. We know also that it is carried on more or less almost everywhere, but especially in the neighborhood of the larger cities, or at points within easy access from them, and also at various distant points, which are visited by the millinery taxidermists or their agents for the express purpose of supplying the demands of the hat-trade in bird-skins. At present only a few specific details can be given, relating to only a few localities; but these may be taken as illustrative of what actually occurs at many points, respecting which the facts are known only in a general way. For many of the data here given, we are indebted to statements published from time to time in *Forest and stream*, the well-known New York weekly journal devoted to field-sports and natural history. In an editorial on 'The destruction of small birds,' published a short time since (March 6, 1884), occurs the following: "We know, for example, of one dealer . . . who, during a three-months' trip to the coast of South Carolina last spring, prepared no less than 11,018 bird-skins. A considerable number of the birds killed were, of course, too much mutilated for preparation, so that the total number of the slain would be much greater than the number given. The person referred to states that he handles, on an average, 30,000 skins per annum, of which the greater part are cut up for millinery purposes." The same article, in referring to the destruction of birds for millinery purposes on Long Island, states, that, during the short period of four months, 70,000 were supplied to the New York dealers from a single village.

A writer in the Baltimore *Sun*, of about the same date, gives some account of the destruction of birds at Cobb's Island, on the coast of Virginia. He says, "An enterprising woman from New York has contracted with a Paris millinery firm to deliver during this summer 40,000 or more skins of birds at forty cents apiece. With several taxidermists she was carrying out the contract, having engaged young and old to kill birds of different kinds, and paying them ten cents for each specimen not too much mutilated for millinery purposes. . . . The birds comprised in this wholesale slaughter are mainly the different species of gulls and terns, or sea-swallows, of which many species in large numbers could formerly be found upon this island. But now only few of these graceful birds remain

upon Cobb's Island itself; and the pot-hunters, or rather skin-hunters, have to go to some distance to carry out their cruel scheme. If we consider, that, with each old bird killed,—and only old birds have a suitable plumage,—also many of the young birds, still unable to take care of themselves, are doomed to starvation, this wholesale slaughter becomes still more infamous and criminal."

Cobb's Island was formerly one of the most noted resorts of the terns, smaller gulls, and other shore-breeding birds along our whole coast; but recent visitors to the island report that the once populous colonies of these birds have been almost completely exterminated by the wholesale slaughter referred to by the writer of the foregoing extract.

Similar butchery has been carried on along the sandy shores of Cape Cod, also formerly a noted resort of these birds; it being reported that 40,000 terns were killed there in a single season by one party for the hat-trade. At points where, a few years since, these beautiful birds filled the air with their graceful forms and snowy plumage, now only a few pairs remain.

The same sad havoc has been wrought with the egrets and herons along our southern shores, the statistics of which, could they be presented, would be of startling magnitude. We only know that colonies numbering hundreds, and even thousands, of pairs, have been simply annihilated—wholly wiped out of existence—in supplying the exhaustless demand for egret-plumes. The heronries of Florida suffered first and most severely; later the slaughter was extended to other portions of the Gulf coast. As an instance of the scale on which these operations are carried, it may be mentioned that one of our well-known ornithologists, while on an exploring tour in Texas, heard an agent of the millinery trade soliciting a sportsman to procure for him the plumes of 10,000 white egrets. Although, in the present case, the sportsman had too much humanity to become the abettor of such a heartless scheme, the incident serves to show on what a grand scale the destruction of these birds is attempted; and doubtless the agent did not fail of eventually securing his coveted plunder.

Among the birds most in favor for hat decoration are the various species of grebes, whose soft, furry plumage is particularly adapted to the purpose, being of durable texture, pleasing in effect, and susceptible of being readily dyed any desired tint. Grebes are used to such an extent, that the source of the abundant supply was not at first evident, owing to the comparative scarcity of the birds in the Atlantic states. It is found, however, that the supply is derived from the far west, mainly from

the Pacific slope, where these birds are more abundant, and whence their skins are brought east in bales, like the peltries of the furrier, or the 'robes' of the bison. The number must range far into the tens, if not hundreds, of thousands annually.

Among the smaller birds it is naturally the brighter colored species that furnish most of the victims, especially the orioles, tanagers, grosbeaks, cedar wax-wings, bluebirds, meadow-larks, and golden-winged woodpeckers. No even approximate estimate can be given of the number sacrificed. Only their conspicuous abundance on hats and bonnets, and their greatly decreased numbers, attest the slaughter to which they are subjected. But scarcely a bird can be named — from the rarest to the commonest, from the plainest of the sparrows to the most gorgeously arrayed denizens of the orchard and forest, from the tiniest warblers and humming-birds to jays, kingfishers, cuckoos, and the larger woodpeckers, and even ptarmigans and grouse (in fragments or entire), and the largest of the shore-birds, with bills half a foot in length (an *outré* and grotesque effect seeming to be sometimes especially sought) — that is not to be met with as an appendage of the female head-dress.

The assemblage of diverse and incongruous forms sometimes met with on the same hat is often striking in the extreme; birds from the opposite ends of the earth, and of the ornithological scale of classification, being brought into most inharmonious combination, viewed even from the artistic stand-point. Bearing on this subject, and illustrating the range of taste in such matters, as well as the extent to which birds are used for hat embellishment, may be given the following inventory, furnished by an ornithological friend, of what recently met his eye in a Madison Avenue horse-car in this city. The car contained thirteen women, of whom eleven wore birds, as follows: (1) heads and wings of three European starlings; (2) an entire bird (species unknown), of foreign origin; (3) seven warblers, representing four species; (4) a large tern; (5) the heads and wings of three shore-larks; (6) the wings of seven shore-larks, and grass-finches; (7) one-half of a gallinule; (8) a small tern; (9) a turtle-dove; (10) a vireo and a yellow-breasted chat; (11) ostrich-plumes. That this exhibition was by no means exceptional as to number or variety is obvious to any one who has given close attention to the ornithological displays one daily meets with in street-cars and elsewhere, wherever he may travel.

Advertisements in newspapers, by milliners, of the stock in hand, also give some suggestions of the extent of the traffic in wings and bird-skins; it being not uncommon to see thousands of wings

(plain or fancy, in natural colors or dyed), as well as thousands of bird-skins (mounted or made up) and thousands of plumes (dyed or plain), advertised by a single dealer, while the dealers themselves number hundreds, if not thousands, in each of our larger cities. Add to these the smaller shops, in country and city, throughout the land, and we get at least some comprehension of the extent of the traffic in birds by the milliners, and the support they receive from the feminine portion of our population.

Respecting the traffic abroad, we learn from an English authority, that there were sold in one auction-store in London, during the four months ending April, 1885, 404,464 West Indian and Brazilian bird-skins, and 356,389 East Indian, besides thousands of Impeyan pheasants and birds-of-paradise.

DESTRUCTION OF BIRD-LIFE IN THE VICINITY OF NEW YORK.

To such an extent has the recent fashion of using birds for hat ornaments been carried, that the waters and beaches in this vicinity have been entirely depopulated of their birds. On the coast-line of Long Island the slaughter has been carried to such a degree, that where, a few years since, thousands and thousands of terns were gracefully sailing over the surf-beaten shore and the wind-rippled bays, now one is rarely to be seen.

The demand for sea-birds of white or delicate shades of color was so great, that many of the professional gunners and market-shooters gave up their usual shooting to enter upon what has proved to be a war of extermination. So long as the taxidermists who work for milliners in the large cities would take all the birds that could be supplied, the gunners were shooting day after day, from daylight until dark.

In the spring of 1884 the writer met a taxidermist from New York city, who was then on a trip along the south side of Long Island, for the purpose of making contracts with the gunners to supply him with a certain number of birds in the flesh, per day. He had facilities for making up three hundred skins daily, and was trying to arrange to get that number of birds. In answer to an inquiry as to whether he could find a market for such a number of skins in New York, he replied that he had no local trade, but that his stock was entirely for export to France.

Between Coney Island and Fire Island inlet there are many marshes, meadows, and low-lying islands, which for years have been the breeding-places of thousands of common terns or sea-swallows; and on the sandy beaches the least

tern and piping plover laid their eggs, and hatched their young. Now this long stretch of country is as a waste place, for the hand of the destroyer has left but lone remnants of what was once a teeming colony.

The small hamlet of Seaford is near the centre of this district, and has contributed largely toward the extermination of the sea-swallows. One of the most active gunners of this place informed the writer that he and his associates had, during the early summer of 1883, sent to market over three thousand terns. The slaughter of these thousands for hat ornamentation is in itself a great evil; but when we consider that the fifteen hundred pairs killed would have each produced an average of two young, or an aggregate of three thousand additional birds during the season, it becomes evident that the wrong is far-reaching.

In the vicinity of Moriches, L. I., the same character of marsh prevails, and the same destruction of seabird-life has been carried on. One of the resident gunners states that the terns are now practically exterminated, while a few years since it would have been an easy matter to shoot fifty birds during a forenoon. An observer at the eastern end of Long Island informs me that the 'summer gulls' (common terns) have greatly decreased in numbers, and the few that are left have become very wild, and difficult of approach.

The sportsman-poet, Isaac McLellan of Greenport, L. I., in a recent communication, states as follows: "There are many gunners (not sportsmen) whose whole business seems to be to kill off the little vocalists, solely for the sake of disposing of their skins and feathers for the ornamentation of ladies' bonnets. If those good women only knew of the destruction of bird-life that their love for finery occasions, I think they would make it unfashionable to wear the feathers of murdered birds. These gunners point their weapons chiefly at the gulls that haunt our shores, and I hear that they sell them by thousands to the New York dealers, at good prices. Formerly I used to see these pretty flutterers in countless flocks along the bay and seashores, but now they seem to be almost extinct. The bluefish fishermen tell me that this is a serious evil to them, as formerly, when they saw these hovering flocks, they knew that the bluefish were there, and could be easily secured. These bird-exterminators also declare bloody war against most other fine-plumaged birds, and gather in the robin, the oriole, the blackbird, the meadow-lark, catbird, and nearly all other kinds of birds."

As already intimated, the slaughter is not confined to sea-birds alone, but is waged with the same destructive force against the more beautiful

of the land-birds. One gunner informed me that during the winter of 1883 he shot for a middle-man over a thousand cedar-birds (*Ampelis cedrorum*). If they had been permitted to live until the next season of reproduction, it is fair to assume that each pair would have reared an average of five young, or an aggregate of twenty-five hundred birds. It is a well-known fact that cedar-birds are very voracious eaters, and feed almost exclusively, during some months of the year, on the span-worm, canker-worm, and small caterpillars. The damage done the agricultural interests of the country by the destruction of these birds is enormous; but, when we multiply it by the hundreds of thousands that have been shot for the same purpose, the damage is beyond calculation.

An observer in Long Island City states, that, in his vicinity, every bird of bright plumage, such as warblers, woodpeckers, thrushes, orioles, etc., is shot for millinery purposes. In New Jersey the same wholesale destruction of bird-life was carried on, until, as I am informed by the Hon. John W. Griggs, president of the New Jersey senate, "The complaint came up from all parts of the state, of the decrease in the number of song and shore birds. Representation was made to me that certain persons had contracts to furnish birds by the thousands to taxidermists in Philadelphia and New York, and that they proposed to gather their skins in New Jersey. The bill introduced into our legislature for the protection of the birds, passed with only one negative vote, and the effect in my own locality [Paterson] has been excellent."

Another informant states, that, during the summer of 1882, taxidermists were stationed at Barnegat and Beach Haven, N. J., purchasing from the natives every thing in the nature of a sea-bird. Terns of all kinds brought ten cents each, and shore-birds the same price. Many of the bay-men gave up sailing pleasure-parties, and became gunners, because this business was more remunerative; as high as fifty dollars, representing five hundred lifeless birds, being made in a week by some. "One cannot help noticing now the scarcity of terns on the New Jersey coast, and it is all owing to the merciless destruction." Besides the birds already mentioned as being immolated on the altar of fashion, thousands of crows, purple grackles (commonly known as crow blackbirds), red-winged blackbirds, and snow-buntings, are used for this purpose.

A New York taxidermist informed me that he had in his shop thirty thousand bird-skins of the species just mentioned, made up expressly for millinery purposes. Should the gunners and taxidermists bear the whole blame? I think not, as they are only supplying the demand created by

the female love of ornament. Take up any daily or fashion paper, and one can see such items as the following, clipped from the New York *Sun* of Dec. 13 and 20, 1885: "Miss Brady looked extremely well in white, with a whole nest of sparkling, scintillating birds in her hair, which it would have puzzled an ornithologist to classify," and "Mrs. Stanton Whitney had her gown of unrelieved black looped up with blackbirds; and a winged creature, so dusky that it could have been intended for nothing but a crow, reposed among the curls and braids of her hair." It is said, 'Where ignorance is bliss, 'tis folly to be wise.' Perhaps, if the lady in question could have seen the crow during its lifetime perched upon and feeding on the decaying carcass of a horse, she might have objected to the association.

On the other hand we quote from the London *Truth* an item showing the humanity of England's queen: "I am glad to hear that the queen contemplates issuing a ukase censuring the barbarous fashion which so many women have lately adopted, of wearing the bodies of birds, or parts of their bodies, in bonnets and hats and on dresses. Her majesty strongly disapproves of this practice, which of late has greatly increased, which is daily increasing, and which most assuredly ought to be abolished."

As long as the ladies continue to demand bird-skins for ornamental purposes, so long will the gunners and taxidermists undertake to supply the market, therefore the initiative in the movement for the protection of birds must be with the 'wives, sweethearts, and mothers,' and not alone with the laws and lawmakers.

WILLIAM DUTCHER.

DESTRUCTION OF THE EGGS OF BIRDS FOR FOOD.

FEW persons living at a distance from the seashore have any idea of the immense destruction of bird-life by residents of the coast, who make the systematic and wholesale robbery of water-birds of their eggs a yearly pastime. A thoughtless and relentless warfare has been waged, until extermination of all bird-life on our shores stares us in the face. This destruction has been carried to such an extent, that many of our water-birds, such as gulls, terns, herons, and shore-birds, have become scarce where formerly numberless thousands added life and beauty to our harbors and beaches. The shooting of these beautiful and graceful ornaments of our water-ways for millinery purposes is undeniably one cause of their decrease; but, great as is this cause, it is in no degree comparable to the destruction made by the

so-called 'egggers,' in their annual forays in the name of food-hunting.

My scientific explorations during the last ten years have taken me to many of the breeding-places of various species of water-birds; and some facts which have come under my observation, illustrating how the few birds still to be found along our extensive coast-lines are gradually succumbing to the slaughter, may prove of interest. There is probably not a port, pass, or bay on the entire coast of Texas, whose inhabitants do not regularly devote several days each year to what they term 'egging.' As soon as the 'scouts' or fishermen report the birds established, and laying their eggs on the islands and secluded beaches, all work is suspended, every craft is pressed into service, and everybody is off to assist in the ghastly sport at the breeding-grounds. Arrived at the desired locality, the first day's work is that of thoroughly destroying every egg already laid; and this ruthless sacrifice of thousands of eggs is made before any are secured by the robbers, that they may avoid carrying away any partially incubated ones. Returning to their boats after this work of destruction, the perpetrators remain in hiding, or quietly sail about the lagoons, until the next day, by which time the distracted birds that had not laid their full complement of eggs when frightened away by the intruders, and who had meantime been hard pressed to deposit their treasures, will have laid many thousands of eggs in the very face of destruction. Two or three days are now devoted to gathering the freshly-laid eggs, and to stowing them away in barrels and tubs in the boats. All eggs, from an inch in diameter upwards, are taken, excepting, perhaps, those of the pelican, whose eggs are too fishy for any stomach. I have known of boats which came a distance of over a hundred miles to gather these eggs, cruising from reef to reef until they had secured a good load. For days after the return from these expeditions, the shops along the coast expose quantities of bird's eggs for sale, which are disposed of cheaply, according to size. As these eggs of wild birds are much more fragile than those of domestic fowls, a very large proportion of them are broken by the rough handling they receive before they reach the markets. No doubt more eggs are thus wasted than are eaten; and, unless one is familiar with the breeding-places of these birds, no idea can be formed of the appalling extent of this yearly destruction. I examined, before the egggers had reached it, one of a group of grassy islands or flats, about the size of a city block, on which were breeding not less than ten thousand birds, consisting chiefly of gulls, terns, and herons;

and, as each pair lays three or four eggs, here were at least fifteen or twenty thousand eggs on one small island. Now, when one remembers that there are hundreds and probably thousands of such resorts, where the birds are annually robbed, what must be the havoc, the cruelty, and the unwarrantable sacrifice of these harmless birds! Is it any wonder that the birds are shy, and hate the very sight of man? Is it not about time that the bird's side of the question was not only defended, but strenuously championed? The effect of this heartless and cold-blooded trampling upon the domestic instincts of birds is not calculated to encourage amicable and social relations between them and man, but quite the contrary, as the following observation will show.

I have seen laughing gulls, and royal and Caspian terns, upon being driven from their nests, deliberately dash at, and destroy with their bills, every egg exposed in the vicinity of their nests, not excepting those of their own species. Their very nature seems changed by this heartless persecution; or, recognizing the purpose of man's invasion, they intelligently and deliberately attempt to thwart his purposes by destroying the prize he covets. Such is the influence man exerts over these intelligent and persecuted birds, instead of making friendly advances to them, and by kindness encouraging in them their naturally docile and amiable propensities. How strongly in contrast is this with the pleasant sight at Geneva, Switzerland, where happy crowds of visitors delight in giving crumbs to the friendly gulls that flock about the bridges, feeding almost from the very hands of the people! There is no reason why the gulls, terns, herons, and other water-birds should not constitute one of the chief attractions at our seaside resorts, enlivening them with their grace and beauty.

In regard to the profits of the 'egging business,' I doubt if even the most successful 'egger' can make as much money as he would have done had he stuck to his regular and much more praiseworthy occupation. The quality of wild bird's eggs is inferior to that of the eggs of the domestic fowl, and consequently their price is low, and frequently barrels of them are thrown away as unsalable. This destruction, therefore, has no excuse in necessity as a source of food-supply.

If a tithe of the truth were known throughout the country at large, concerning the sacrifice of bird-life in the names of 'business,' 'enterprise,' 'food,' 'sport,' and what not, from Maine to Mexico, and from California to Alaska, there would be such a cry of remonstrance as would make the bird-destroyers hang their heads for shame.

Another fact not generally known beyond the

scene of its occurrence, relating, however, to the destruction of young birds, rather than to eggs, may be here stated, which for devilish 'enterprise' exceeds any thing that has ever come under my notice. In 1877, and also in 1878, while studying the birds about Corpus Christi Bay, Texas, I examined a low grass-flat called Pelican Island, so named on account of the numbers of brown pelicans that had for years taken it for their breeding-place, to the exclusion of all other species. Here many thousands of these great birds were tending their eggs and young, breeding in such numbers that one could step or jump from nest to nest, over nearly, if not quite, every square yard of the island. Four years later I cruised over the same course, and noticed that the pelicans had deserted this grassy island entirely, and were scattered, in diminished numbers, on other islands which were not occupied by them when I made my former trips. On inquiring into the cause of this change, I learned from prominent citizens, that two or three enterprising (?) men had conceived the idea of making their fortunes from pelican-oil, and had erected 'trying-out' shanties on the mainland. They went to the island in question in large boats, and carried off cargoes of young pelicans in all stages of growth, and boiled them up for their oil. The only satisfaction I could get from the history of this experiment was, that the men could not sell the oil, and had nothing but their nefarious labor for their pains. Think of the enormous sacrifice of life for a foolish experiment! This heartless slaughter is hardly equalled in cruelty by the so-called sport of the union troops during the war against secession, who, while idly lying in transports off the passes along the coast, amused themselves by fastening a fish to a plank which was so weighted as to be quite submerged: they would then watch the pelicans dive for the fish, while bets were freely interchanged as to the probability of the bird getting a broken neck, with the odds decidedly in favor of the death of the pelican. Instances without number might be given to show that man, unchecked by law, will ruthlessly destroy the very things most useful to him if preserved and protected.

The question may be asked, What are pelicans, cormorants, gulls, terns, and herons good for? It may be answered, If for nothing else, they are good to look at and to give life and beauty to the shores and bays. They most assuredly do no harm: on the contrary, they are the scavengers of the shoal waters of our shores, as the buzzards are of the land; and if it were not that the water-birds keep in check the superabundance of almost valueless fishes and other animals that multiply in

prodigious numbers in the shallow waters, especially in warm climates, such a stench would arise from the excess which would necessarily be washed up on the shores, that all human existence about the bays would be out of the question. Nature admirably provides a check to an over-supply, as well as a protection to those weak in numbers, and, if mankind interferes too much with the harmony, retribution will surely follow. Many of our birds are fast going the way of the bison, never to return. If men were not held in check by public opinion and the necessary laws, our land would soon be as barren of all animal life as are the plains of bison. In our greed, destructiveness, and lack of thought for our future comfort and happiness, we are not so very far in advance of the South-Sea islander, who plants his cocoanut, and has not the patience to let it grow, and yield a thousand-fold, but soon digs it up and eats it, fearing lest he lose it altogether, and then wonders why other islands are more favored than his own. GEO. B. SENNETT.

THE RELATION OF BIRDS TO AGRICULTURE.

THE utility of the so-called insectivorous birds — by which are commonly meant species which feed almost exclusively upon insects, like wood-peckers, fly-catchers, swallows, vireos, warblers, and, in less degree, the thrushes — has never been seriously questioned. The extent, however, to which other species subsist upon an insect-diet is not generally known or even suspected. Recent investigations respecting the food-habits of many of our birds show some surprising results, highly favorable to the species investigated. It has been found, for example, that all birds are to a large degree insectivorous, including hawks and owls, and even plovers and sandpipers. Professor Aughey, in his report on the food of the birds of Nebraska, published in one of the reports of the U. S. entomological commission, calls special attention to the importance of not only these birds, but the different species of the grouse family, as a check upon the grasshopper-scurge.

The great importance of the smaller birds in general, including the song-birds, as a check upon the undue increase of insect-life, and consequently the desirability of their strenuous protection, being well-nigh universally conceded, attention will be briefly called to certain species hitherto more or less generally under ban as injurious to agriculture, and whose destruction is considered praiseworthy. Foremost in this category are hawks, owls, crows, and jays. The robin, the brown-thrasher, the catbird, the chewink, and the various

kinds of blackbirds, are also excluded from protection under the bird-laws of most of the states. Crows are accused, with some justice, of depredations upon the young corn, and of now and then robbing a stray hen's nest, or of gobbling up a young chicken. These last enumerated misdemeanors are exceptional, too rare even to require formal notice. The depredations upon the young corn are easily guarded against, as a small quantity of grain thrown upon the ground is greatly preferred by the crows to the few kernels they can acquire by pulling that which has been planted. Many farmers, indeed, consider it much more to their interest to feed the crows for a few days than to destroy them, recognizing the fact that at all other times they are among their best allies; their food consisting largely of grasshoppers, cut-worms, and other noxious insects. Why the jays have been tabooed is hard to explain, their pilferings being at most of a trivial character, while, as destroyers of noxious insects, no birds, it may be safely said, are more important. The other species named above (aside from the hawks and owls) are well known to levy tribute on the small fruits of the garden, the robin particularly, to a somewhat serious extent; while the catbird, brown-thrasher, and chewink not unfrequently pull the corn planted near the thickets they inhabit. Otherwise these species are among the most useful of our birds, whose services are to such an extent recognized, that opinion is divided — even among those who suffer most from their depredations — on the subject of whether or not they are, during the short period of the fruit-season, to be treated as outlaws. In certain portions of the country, particularly in the south, the depredations of the blackbirds upon the grain and rice-fields are of serious character; but throughout at least three-fourths of the states there is certainly no good reason for destroying these otherwise useful birds.

Hawks and owls, from time immemorial, have been treated as foes, and legitimate targets for the rifle or shot-gun on all occasions; their destruction having been not unfrequently encouraged by the offer of bounties from the public treasury for their heads. Of late, frequent protests have been raised against this indiscriminate slaughter. These protests come mainly from ornithologists who have studied their food-habits, and become convinced that their destruction is not only unnecessary, but unwise. A number of published protests might be here cited, did space permit, based on actual knowledge of the facts in the case, and giving statistics of the contents of stomachs of many examples of different species of birds of prey. Only a few of the statistics at hand can

be here presented. Mr. B. H. Warren, a well-known ornithologist, in a paper entitled 'What hawks eat,' published in a recent report of the Pennsylvania board of agriculture, states, respecting the red-tailed hawk (*Buteo borealis*), — the 'hen-hawk' *par excellence* of eastern North America, — that an examination of the stomachs of one hundred and one examples of this species "revealed in eighty-one chiefly mice and small quadrupeds, also some small birds; nine, chickens; three, quail; two, rabbits; one, a part of a skunk; one, a red squirrel; one, a gray squirrel; three, snakes." In the stomachs of thirty-four red-shouldered hawks (*B. lineatus*) examined were found, in twenty-three, mice, small quadrupeds, grasshoppers, and coleopterous insects; in nine, frogs and insects; in the remaining two, small birds, hair, and orthopterous insects. Of twelve broad-winged hawks (*B. latissimus*), four contained mice; three, small birds; four, frogs; one, crayfish and insects. The contents of the stomachs of twenty-nine sparrow-hawks (*Falco sparverius*) was, in fifteen cases, principally mice with traces of various insects; in six, grasshoppers; in two, coleoptera and grasshoppers; two, meadow-larks; four, sparrows. Nine rough-legged hawks (*Archibuteo lagopus sancti-johannis*) examined had all fed exclusively upon field-mice. Of eleven marsh-hawks (*Circus hudsonius*), the stomachs of five contained mice; of two, small birds; of three, frogs; the other, grasshoppers and rabbit's hair.

The hawks of the genus *Accipiter*, on the other hand, present a bad record; fourteen out of twenty-four Cooper's hawks (*A. cooperi*) being found to contain chickens, seven others, birds, and three, only mice and insects. Of sharp-shinned hawks (*A. velox*), four out of fifteen contained chickens; nine, small birds; one, mice; and one, insects. On the other hand, it is known that several other species of the hawk family feed almost exclusively upon insects, mice, snakes, and frogs.

Careful examination of the contents of stomachs of owls, of which the results have been published, show that field-mice constitute their principal food, and that grasshoppers and other insects enter largely into the diet of all the smaller species. The larger species add to their usual fare of mice and the smaller mammals, many grouse and rabbits.

In short, enough is known of the regimen of our rapacious birds to show that they are only exceptionally harmful to the farmer; their infrequent raids — mostly by a few species — on the poultry being much more than offset by their destruction of mice, grasshoppers, and other injurious insects.

In this connection, reference may be appropri-

ately made to the letters from farmers and fruit-growers, as well as bird-lovers, from various parts of the country, addressed to the committee of the American ornithologists' union on bird-protection, detailing the vast injury they recognize as resulting to agriculture from the present wholesale slaughter of birds. An extract from a letter from a farmer in Dexter, Mich., will indicate the general purport of these communications. "The destruction of birds has been and is carried on here to such an extent that it is hardly possible to raise any kind of fruit; even the grapes, as well as the apples, being too wormy for use or sale. Boys, and even sires of families, but not men, go out and shoot swallows, robins, larks, etc. It makes no difference if they are nesting; and many a nest of young birds have starved on account of their parents being shot. And the small boy with his sling-shot destroys many — and all for the desire to murder. . . . There is a law to prohibit all this; but those who could enforce it take no interest in the matter. Not a single person saves the skins for gain: the birds are thrown away, or left where they fall. I have protested against the cruelty, but to no purpose, except in a few instances. The game and bird laws should be enforced by men appointed for the purpose, who should receive a salary, so that they may make it a business."

BIRD-LAWS.

MOST of the states and territories have on their statute-books laws for the protection of game and fish, regulating the season of hunting and fishing, and providing penalties for the taking of game or fish during certain portions of each year, or, in particular cases, for a series of years. These laws are intended, in most cases, to give protection to 'useful' birds, in addition to the game-birds, and their nests and eggs, at all seasons. In general, these laws are crude and unsatisfactory so far as they relate to supposed useful birds, and also in relation to many others which are either protected merely during certain months, or not at all, as is the case with many of the marsh and shore inhabiting species, such as the herons, terns, gulls, etc. Most of the laws exclude from protection all hawks and owls, crows, jays, and black-birds, and, in some cases, robins and other kinds of song-birds, woodpeckers, etc. A few of the laws make provision for collecting birds and their eggs for scientific purposes, often in a lax way, but occasionally, as in Maine, with considerable stringency; while the new bird-law of New Jersey prohibits the destruction of song-birds, their nests or eggs, for any purpose whatever. Defective as

the present laws now generally are, they would, if thoroughly enforced, prevent the disgraceful slaughter now so general, and untrammelled by any legal interference. As already so many times reiterated in this series of papers, the fault is not so much lack of laws, or inadequate legislation, as the absence of nearly all effort to interpose any obstacles, legal or otherwise, in the way of free slaughter. So apathetic is the public in all that relates to bird-protection, that prosecution under the bird-protection statutes requires, on the part of the prosecutor, a considerable amount of moral courage to face the frown of public opinion, the malignment of motive, and the enmities such prosecution is sure to engender.

None of the bird-laws are above improvement, even in so far as they relate to the protection of game-birds; but, in respect to the non-game birds, nearly all require more or less change. If possible, it would be well to have uniform laws throughout all the states and territories, varying only in respect to the time of the close season, and such other points as difference of season, kind of game to be especially protected, etc., according to local conditions. At present, certain birds are protected in some states which are outlawed in others, or are treated as game-birds in some, and not so treated in others.

Birds, as regards legislation, may well be divided into two classes, — game-birds, and birds which are not such; and the laws relating to each class should be separate and distinct. The game-birds should be left to the care of sportsmen and game-protective associations, since self-interest on the part of the more intelligent sportsmen will dictate more or less wise legislation for the preservation of the birds on which their sport depends. But in respect to game-birds, public opinion should be so far enlightened as to secure the enforcement of proper legislative enactments; which is notoriously not the case at present. All other birds should be left to the care of bird-lovers and humanitarians, who should see that proper laws for their preservation are not only enacted, but duly enforced. As already shown in preceding pages of this *Supplement*, those who know best, from having scientifically investigated the subject, are convinced that none of our native birds should be outlawed as unqualifiedly, or even to any serious degree, injurious. A few exceptions might be made, were it practicable; but, in the general ignorance of legislators and of the public generally, — or their inability to make proper distinction through inability to recognize by proper names one kind of hawk, for instance, from another, — the safe way is to attempt no such discrimination in legislation. The slight harm resulting from

protecting half a dozen species more or less harmful would be more than offset by the indiscriminate destruction which would necessarily result from such a loophole.

The reason for keeping legislation respecting game-birds distinct from that relating to the other species is mainly to avoid conflict of interests respecting such legislation, which is more or less sure to follow in any attempt at combined legislation respecting all birds in one act. Sportsmen's clubs and game-protective associations in attempting to provide proper game-laws often find strong opponents in the game-dealers and market-gunners, who often succeed in defeating judicious legislation. If all birds are treated under the same act, attempts to improve the portions of such acts as relate to useful birds are often prevented through opposition to certain clauses of the game-sections obnoxious to pot-hunters and game-dealers, as has recently been the case with attempted judicious amendments to the bird-laws in the state of Massachusetts.

There should also be some provision for collecting birds, their nests and eggs, for scientific purposes, in behalf of our natural history museums and of scientific progress in ornithology. As already shown in these articles, the birds destroyed in the interest of science, notwithstanding the outcry to the contrary from certain sources, are relatively few in comparison to the number destroyed for millinery and other mercenary purposes, — so small as not to materially affect the decrease of any species. But such license, unless rigidly guarded, is liable to abuse, and should be hedged about with every practicable safeguard. The number of such licenses issued in any state should be very small; they should be granted with strictest regard to the fitness of the recipient to be allowed such a favor; and their abuse or misuse made a misdemeanor subject to severe penalties. Obviously, the power to grant them should, so far as possible, be vested in persons having some knowledge of ornithology, or who are able to recognize the difference between collecting birds for scientific purposes and as 'curiosities,' or for traffic other than strictly in the interest of science. It should be further understood that these licenses grant no immunity from the ordinary laws of trespass, or laws against the use of fire-arms at improper times or places, or in violation of any of the provisions of game-protective acts. The system of issuing such licenses has needlessly been brought into disrepute through the gross ignorance and apathy of the general public as to their real purpose and limitations. For most of the abuses of the system there is already abundant remedy. Any person holding

such a license, who uses it as a shield against prosecution for illegal or indiscriminate slaughter of birds for any and all purposes, is successful only to such extent as the ignorance or apathy of the community among which his misdeeds are committed happen to give him immunity. The fault is not in reality chargeable to the law, or the system permitting the granting of certificates for scientific collecting. In this matter, as in all else relating to bird-destruction, all that is necessary to prevent abuses is a proper comprehension of the laws relating to the subject, and a public sentiment not only favorable to their enforcement, but watchful against any infringement of their provisions.

With a desire to bring about more intelligent, uniform, and desirable legislation for the protection everywhere, and at all times, of all birds not properly to be regarded as game-birds, the American ornithologists' union committee on bird-protection have had under careful consideration a draught of a bird-law drawn with special reference to its fitness for general adoption throughout the United States and the British Provinces, and with regard to just what birds should be so protected. It is intended as a guide or model, which may serve as a basis for legislation. From its pertinence in the present connection, it is given below in full. Possibly some additional provisions may still be desirable, relating especially to the designation of certain officers to secure its strict observance, the amount of the fine, and whether or not a part of the fine should go to the complainant, — features, however, that doubtless may be safely left to legislative discretion.

[AN ACT FOR THE PROTECTION OF BIRDS AND THEIR NESTS AND EGGS.]

SECTION 1. — Any person who shall, within the state of —, kill any wild bird other than a game-bird, or purchase, offer, or expose for sale any such wild bird, after it has been killed, shall for each offence be subject to a fine of five dollars, or imprisonment for ten days, or both, at the discretion of the court. For the purposes of this act the following only shall be considered game-birds. The Anatidae, commonly known as swans, geese, brant, and river and sea ducks; the Rallidae, commonly known as rails, coots, mud-hens, and gallinules; the Limicolae, commonly known as shore-birds, plovers, surf-birds, snipe, woodcock, sandpipers, tattlers, and curlews; the Gallinae, commonly known as wild turkeys, grouse, prairie-chickens, pheasants, partridges, and quails.

SECT. 2. — Any person who shall, within the state of —, take or needlessly destroy the nest or the eggs of any wild bird, shall be subject for each offence to a fine of five dollars, or imprisonment for ten days, or both, at the discretion of the court.

SECT. 3. — Sections 1 and 2 of this act shall not apply to any person holding a certificate giving the right to take birds, and their nests and eggs, for scientific purposes, as provided for in section 4 of this act.

SECT. 4. — Certificates may be granted by [here follow the names of the persons, if any, duly authorized by this act to grant such certificates], or by any incorporated society of natural history in the state, through such persons or

officers as said society may designate, to any properly accredited person of the age of eighteen years or upward, permitting the holder thereof to collect birds, their nests or eggs, for strictly scientific purposes only. In order to obtain such certificate, the applicant for the same must present to the person or persons having the power to grant said certificate, written testimonials from two well-known scientific men, certifying to the good character and fitness of said applicant to be intrusted with such privilege; must pay to said persons or officers one dollar to defray the necessary expenses attending the granting of such certificates; and must file with said persons or officers a properly executed bond, in the sum of two hundred dollars, signed by two responsible citizens of the state as sureties. This bond shall be forfeited to the state, and the certificate become void, upon proof that the holder of such a certificate has killed any bird, or taken the nest or eggs of any bird, for other than the purposes named in sections 3 and 4 of this act, and shall be further subject for each such offence to the penalties provided therefor in sections 1 and 2 of this act.

SECT. 5. — The certificates authorized by this act shall be in force for one year only from the date of their issue, and shall not be transferable.

SECT. 6. — The English or European house-sparrow (*Passer domesticus*) is not included among the birds protected by this act.

SECT. 7. — All acts, or parts of acts, heretofore passed, inconsistent with or contrary to the provisions of this act, are hereby repealed.

SECT. 8. — This act shall take effect upon its passage.

AN APPEAL TO THE WOMEN OF THE COUNTRY IN BEHALF OF THE BIRDS.

THE relation of the women of the country to the present lamentable destruction of bird-life has been several times alluded to in the foregoing pages; but the matter is so important, it demands more formal notice in the present connection. The destruction of millions of birds annually results from the present fashion of wearing birds on hats and bonnets. The women who wear them, and give countenance to the fashion, have doubtless done so thoughtlessly, as regards the serious destruction of bird-life thereby entailed, and without any appreciation of its extent or its results, considered from a practical stand-point. Until recently, very rarely has attention been called to the matter, or the facts in the case been adequately set forth. They have therefore sinned, for the most part, unwittingly, and are thus not seriously chargeable with blame. But the case is now different, and ignorance can no longer be urged in palliation of a barbarous fashion. Obviously it is only necessary to call the attention of intelligent women to the subject, as now presented, to enlist their sympathies and their efforts in suppression of the milliner's traffic in bird-skins. As a recent writer (Mr. E. P. Bicknell, secretary of the A. O. U. committee on bird-protection) in the *Evening post* of this city has not only forcibly appealed to the women in behalf of the birds, but suggested to them certain desirable lines of action, this brief reference to the subject

may well be concluded with a few pertinent extracts from the article in question.

"So long as demand continues, the supply will come. Law of itself can be of little, perhaps of no ultimate, avail. It may give check; but this tide of destruction it is powerless to stay. The demand will be met; the offenders will find it worth while to dare the law. One thing only will stop this cruelty, — the disapprobation of fashion. It is our women who hold this great power. Let our women say the word, and hundreds of thousands of bird-lives every year will be preserved. And, until woman does use her influence, it is vain to hope that this nameless sacrifice will cease until it has worked out its own end, and the birds are gone. . . . It is earnestly hoped that the ladies of this city can be led to see this matter in its true light, and to take some pronounced stand in behalf of the birds, and against the prevailing fashions.

"It is known that even now birds are not worn by some, on grounds of humanity. Yet little is to be expected from individuals challenging the fashion: concert of action is needed. The sentiment of humanity once widely aroused, the birds are safe. Surely those who unthinkingly have been the sustaining cause of a great cruelty will not refuse their influence in abating it, now that they are awakened to the truth. Already word comes from London, that women are taking up the work there. Can we do less? It needs only united action, sustained by resolution and sincerity of purpose, to crush a painful wrong, — truly a barbarism, — and to achieve a humane work so far-reaching in its effects as to outswEEP the span of our own generation, and promise a blessing to those who will come after."

There are already in England, it may be added, two societies organized expressly in aid of the preservation of birds 'in Great Britain and all other parts of the world.' The Selborne society, originated by George Arthur Musgrave of London, appeals to Englishwomen "to forswear the present fashion of wearing foreign or English bird-skins. Our countrywomen are asked to inaugurate a return to a mode which, though half forgotten now, is assuredly more becoming to the wearer than trophies of robins and sandpipers." Lady Mount Temple is not only a member of the plumage section of the Selborne society, but has written a vigorous protest against the fashion of wearing dead birds on dresses, bonnets, and hats. The section is under the patronage of her Royal Highness the Princess Christian of Schleswig-Holstein, and numbers among its membership twenty ladies of title, and also Lord Tennyson, Robert Browning, Sir Frederick Leighton, and Rev. F. O. Morris.

THE AMERICAN ORNITHOLOGISTS' UNION COMMITTEE ON BIRD-PROTECTION.

THE American ornithologists' union committee was recently organized in New York city with the following membership: Mr. George B. Sennett, chairman; Mr. Eugene P. Bicknell, secretary; Mr. William Dutcher, treasurer; Mr. J. A. Allen, Dr. J. B. Holder, Dr. George Bird Grinnell, and Mr. L. S. Foster, all of New York city; Mr. William Brewster, Cambridge, Mass.; Mr. Montague Chamberlain, St. John, N.B.; Col. N. S. Goss, Topeka, Kan.

The committee is desirous of collecting facts and statistics bearing upon the subject of the destruction of our birds, and will welcome information from any source. It also extends the promise of its hearty co-operation to all persons or societies who may be interested in the protection of birds.

The headquarters of the committee are at the American museum of natural history, Central Park, New York city, where the officers or any of the members may be addressed.

THE Third report of the Cornell university experiment-station, 1883-84 and 1884-85 (Ithaca, N. Y., *Andrus & Church*, 1885, 39 p., 8°), contains an account of work done in the years 1882-85 chiefly by Professors Roberts and Caldwell. Although the experiments are comparatively simple, and show plainly that they were made in the intervals of other duties, they still show a degree of insight and accuracy in plan and execution, and are reported with a clearness of statement which we sometimes look for in vain in more pretentious reports. We may mention particularly Professor Roberts's determinations of the value of stable-manure, and Professor Caldwell's comparisons of the chemical composition and nutritive effect of certain rations for cattle. The subject of the first-named experiment is one which has usually been treated deductively, and hence these experiments are of interest not only in their direct application to farm practice, but because they serve to a certain extent to justify the deductions of science. The feeding-experiments show the uncertainty attaching to the use of the so-called 'feeding-standards' or 'standard rations' which have been somewhat widely recommended by writers on agricultural science. Evidence seems to be accumulating that these standards, in their present form, are very uncertain guides, and that, even if not based on false premises, they require great modifications before they can be made of much use to those most needing the information.

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